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AMERICAN INDUSTRIES.—No. 47.

THE MANUFACTURE OF DYNAMO-ELECTRIC MACHINES AND ELECTRIC LAMPS.

The Weston machine for electro-deposition of copper, silver, nickel, and gold is too well known to need any description here. Nearly all the large electroplating and electrotyping establishments in this country use them. They are also extensively used in England, France, Belgium, and are found in use in nearly all parts of the civilized world. A large machine of this kind was recently built for the Italian Government for the deposition of copper.

The light machine shown in our engraving, although largely used in this country, is not so well known. It has been designed and constructed strictly in accordance with scientific principles, the utmost care having been taken to avoid loss of energy in the machine itself. The armature is built up of a series of thin perforated iron disks, which are firmly secured to the shaft by means of two nuts. Between the disks there are spaces of about one-eighth of an inch. At the end of the armature there is a tube surrounding the shaft, but larger in diameter than the shaft, and terminating at one end in a flange nearly equal in diameter to the armature disks. Each end of the armature consists of a large iron disk, having ribs on its periphery extending from one side of and parallel with the shaft. In the end of this thick disk a deep circular groove is cut, and a number of holes are bored through it parallel with the shaft. When the flanged tube is pushed over the shaft and fixed to the end of this thick disk the deep groove forms a chamber.

In the periphery of the thin disks a number of grooves are cut, so that when the disks are placed side by side on the shaft these spaces are in line, thus forming grooves extending the whole length of the armature. The wire is wound in these grooves on both sides of the armature and parallel with the shaft. The wire is wound in a manner somewhat similar to that adopted by Siemens, and the armature when covered with the wire is perfectly cylindrical.

Quite an important feature in this machine is the means adopted to keep the coils and other parts of the machine as cool as possible. This is accomplished in the armature by making the armature perform the function of an ordinary blower. The flanged tubes which envelope the shaft extend beyond the ends of the coils, and thus leave an opening at the ends near the center of the armature through which air may enter and pass into the chamber between the thick iron disks forming the ends and the flange of the tubes, and from these through the holes in the end disks into the perforated sheet iron disks, and thus pass between them and escape through the spaces between the disks on the periphery of the armature. In order to increase the circulation, air-vanes extend through these iron disks from end to end of the armature. The ends and poles of the magnets are also perforated in order to allow the air to circulate through them and cool them.

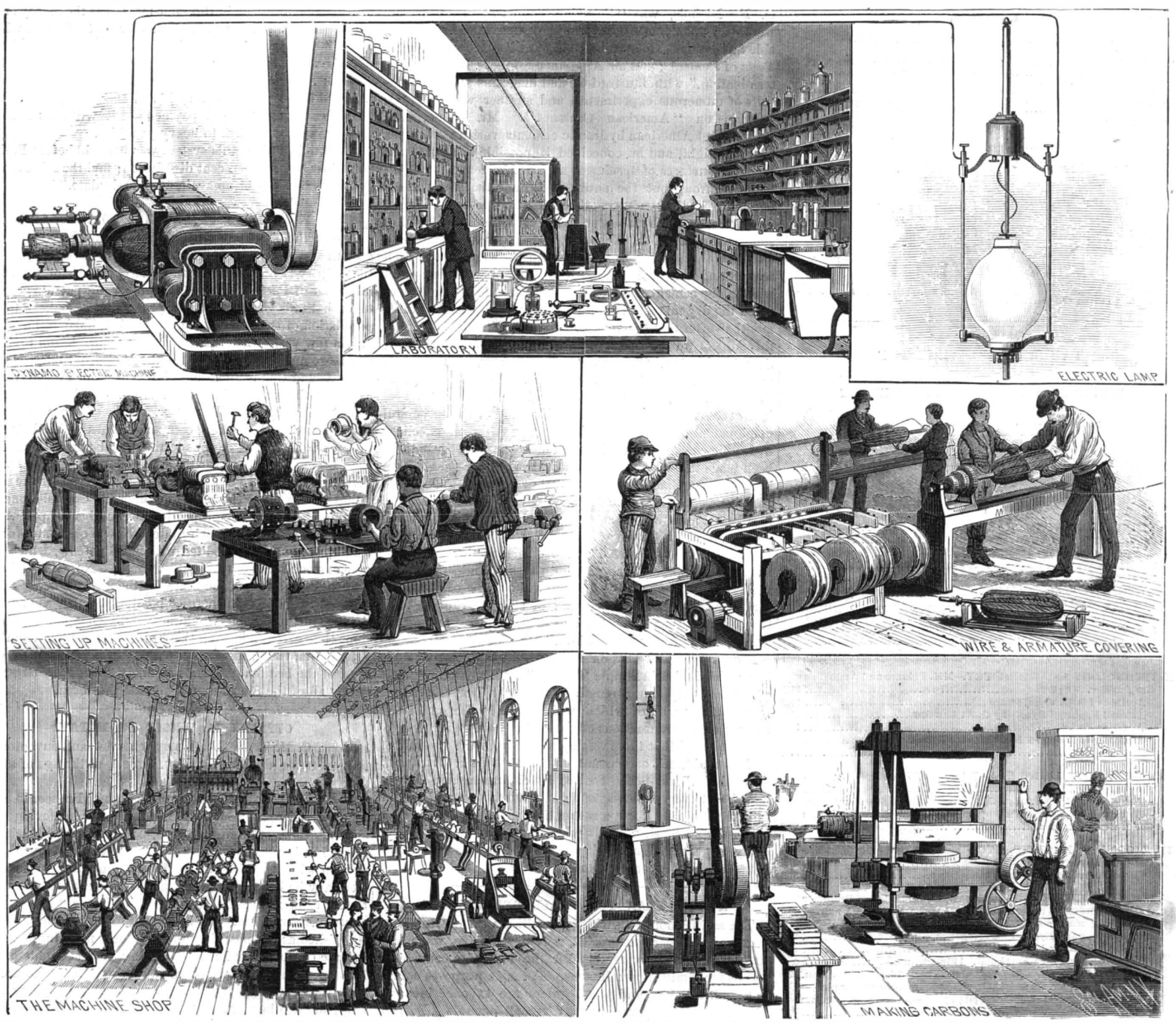
The report of Professor Morton to the American Light-house Board shows the remarkable performance of this machine. The machines entered at this competitive test were the Siemens, Brush, Maxim, Wallace, Hockhausen, and Weston. The Weston machine greatly excelled all others. It gave nearly double the light per horse power, when compared with the Siemens.

The lamp manufactured by this company for the purposes of general illumination is shown in one of the views in the engraving. It is remarkable for its simplicity and the excellence of its performance. At present twenty-five of these can be run on a single circuit by the current from one machine; and Mr. Weston hopes soon to be able to double this number. Mr. Weston has spent much time and devised many ingenious plans for working a large number of lamps on one circuit. Several hundred of these lamps are now in constant use in factories, hotels, stores, steamboats, etc.

The Weston Electric Light Company are also building machines for the transmission of power by electricity, machines for telegraphy, etc. The works are run night and day, and use the electric light exclusively for lighting the factory.

The engraving shows several of the departments of the

[*Continued on page* 405.]



THE MANUFACTURE OF DYNAMO-ELECTRIC MACHINES AND ELECTRIC LAMPS.—THE WESTON ELECTRIC LIGHT CO., NEWARK, N.J.

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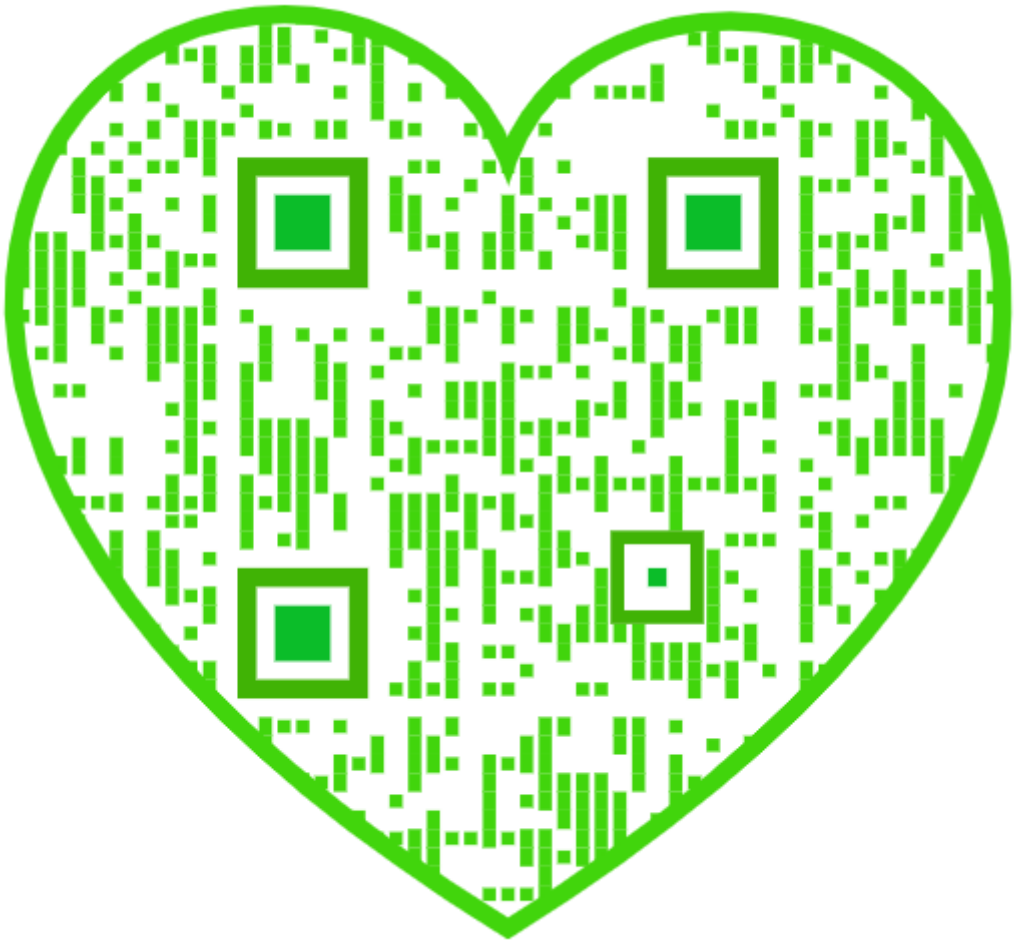

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THE AMERICAN SOCIETY OF CIVIL ENGINEERS.

The Twelfth Annual Convention of this society was held at St. Louis, Mo., May 25 to 28. Mr. Albert Fink, the president, not being in attendance, Captain James B. Eads was elected chairman. There were present a large number of members and visitors, including leading engineers from all sections of the country. The programme included daily sessions for the reading of papers and the discussion of topics of interest in the engineering profession, together with excursions to allow of the inspection of notable engineering works in St. Louis and its vicinity.

Among the visits made, one was to the St. Charles Bridge over the Missouri, for which a new span of 312 feet length was completed the 1st of April last. The floor of the bridge is of iron beams, thirty inches deep; on each side of the rail is an iron trough, ten inches wide and five inches deep, and outside of this is a timber guard, 12x12 inches, all to prevent damage to the trusses by derailment. Another visit to the St. Louis Water Works was of great interest to the attending engineers. To supply St Louis the turbid waters of the Mississippi are pumped into four receiving basins, each 600 feet long by 270 feet wide, and about 16 feet deep, where the water is allowed to remain until the sediment settles, which it does at the rate of about one inch of deposit per week. It takes about a week for the water to become clear, when it is supplied to consumers, the high service being supplied from a reservoir into which the water is pumped by four large engines. The deposit in the settling basins is loosened by hard labor and washed out by a powerful stream of water. At the Vulcan Steel Works, in South St. Louis, an inspection was made of an establishment at present capable of turning out 200 tons of steel rails per day, and the furnaces of the Meier Iron Co., operated by the Missouri Furnace Company, were also visited. The latter are in Illinois, opposite Carondelet, and are making an average production of 160 tons of Bessemer pig iron per day.

Among the papers presented to the convention, one was on "The Hudson River Tunnel," by Charles B. Brush, of Spielman & Brush, the engineers in charge of that work, who furnished the plans from which our illustrations of the tunnel were made in the SCIENTIFIC AMERICAN and SUPPLEMENT a few weeks since. The subject of another paper, by O. F. Nichols, was "Peruvian Tunnels." Two papers were read upon cements, a subject which raised considerable discussion. One was by D. J. Whittemore, on "Tensile Tests of Cements, and an Appliance for more Accurate Determination," with illustrations and diagrams giving the results of numerous experiments, and another was by F. O. Norton, on "American Cements." Mr. Whittemore showed that American hydraulic cements varied twenty per cent in weight, and he conceived it possible that in some cases the surfaces of specimens acquired a tenacity not extending throughout the entire mass, and that "a surface hardening had taken place, through some process of crystallization, or by the absorption of carbonic acid, forming subcarbonates." Mr. Norton said that from 1,000,000 to 1,500,000 barrels of Rosendale cement were made each season, and that "when a small amount of water is used in mixing the cement it gives a greater tensile strength than when the dry mixture is used, but only for a period of three months—after that the reverse is true." The discussion on this subject was participated in by Messrs. Francis, Harlow, Schmidt, Norton, Chesbrough, Whittemore, and Hutton, and quite pertinent thereto, but which, from the report of the proceedings, does not appear to have been referred to, is the recent announcement from England of the successful employment of blast furnace slag in making an excellent hydraulic cement. This hitherto waste product has there been made into a cement, which in three days is said to have been stronger than Portland cement at seven days; in seven days it was stronger than Portland cement at three months; in fifteen days it was stronger than Portland cement at three months, and in twenty-eight days it was stronger than Portland cement at seven years. This result, says *Engineering*, was obtained "by mixing the slag sand supplied by the Teet Iron Company with the white chalk of Essex, in the proportion of about one ton of slag sand to one and three-fourths tons of chalk, and subsequently burning the same in an ordinary cement kiln."

Papers were presented on several other subjects, including "Web Stains in Simple Trusses," by E. Sweet, Jr., and "Ultimate Crippling Strength of Wrought Iron Columns," by C. L. Gates, all of which will appear in the published reports of the transactions of the society; but general regret was expressed that there was no report from the Committee on Iron and Steel, on account of the absence in Europe of General William Sooy Smith, its chairman, and it was hoped that every member of the Convention would use his influence to bring about a restoration of the Board for Testing Iron and Steel, a result which not only engineers, but every one engaged in any department of mechanical industry, should endeavor to promote.

A NEW PLAN FOR SMALL REMITTANCES.

The satisfaction with which the withdrawal of fractional currency in paper was greeted, a few years ago, was measurably tempered by regrets for the loss of a convenient means for remitting small sums. For such purposes coin is not at all suitable, and postal orders are at once inconvenient and relatively very costly for small amounts. Postage stamps of the larger denominations might answer the purpose imperfectly if they were exchangeable for stamps of smaller value, as it is this method of remitting usually subjects the receiver to inconvenience, if not actual loss, since few people can make use of the larger stamps in any considerable quantity. Several more or less clever devices for overcoming the difficulty have been suggested by correspondents of this paper, but none seem to have received the approbation of the postal authorities. Possibly something more may come from the plan proposed by Mr. Chetwynd, receiver and accountant general to the British post office. It appears from a late report of the postal department that a large part of the 17,000,000 money orders issued in the year ending March, 1879, were issued for sums for which commission was less than three pence; and on all such orders there was an absolute loss to the department, thus compelling a readjustment of the rates. With the withdrawal of the lower rates the money order ceased to be economical to remitters of small sums, and some other cheap and convenient remitting service was urgently called for.

Accordingly Mr. Chetwynd, who for more than forty years has taken a prominent part in the improvement of the postal service, and is particularly known as the author and joint organizer of the system of government savings banks so successful in England, has suggested a system of post office notes. As described by the author of the system, the new note is designed to combine the simplicity of a postage stamp as the subject of an account with the advantages of a small bank post bill, a circular note, and a check issued by what may be called a government bank, and payable at any one of the five thousand Government banks throughout the United Kingdom to the order of any person named by the purchaser of the note in writing on the back of it.

To begin with, it is proposed to issue four classes of these notes—namely, for 2s. 6d., 5s., 10s., and 20s.—at 1d. commission for the former two, and 2d. the latter two amounts, and it is the intention of the post office to issue them in books for use as required, as well as singly.

These notes will differ in character from our abandoned postal or fractional currency in several particulars. They will not be legal tender, and will be limited in their period of currency. Besides, though in the first instance an open note payable to the bearer on demand, a note may be crossed at once, giving it the security of a check similarly dealt with, or it may be localized in the same manner as the money order by the simple insertion of a particular post office, at which alone it will then be payable; while the mention of the payee's name adds further security to the note. But, whether open or otherwise, the postal note will require to be indorsed by the bearer before it will be cashed, so that any fraudulent attempt to get payment of it will thus involve forgery, and be subject to heavy penalties.

A bill to introduce this system was brought before Parliament just before the recent dissolution; and the scheme will doubtless be brought up again at an early date.

THE PROPORTION OF PATENTS TO POPULATION.

One of the most interesting subjects connected with the growth and development of manufactures in various parts of the country is presented in the yearly reports of the Commissioner of Patents, where the number of patents granted to each State yearly, and the proportion they bear to the population of the State, are presented in tabular form. It is only a few years since that the Patent Office began to issue any large number of patents to the Western States, Massachusetts and Connecticut and New York and Pennsylvania, as being the principal seats of manufacturing industries, standing far ahead in this matter. It is of the last importance, however, in making comparisons of this kind that we proceed from correct data as to the actual population. For the past ten years the growth of the country has been wonderfully rapid, and yet the population as given by the census of 1870 is made the basis on which the Commissioner of Patents figures out the proportionate number of patents to the total population of each State. New York State, for instance, for 1879 was credited with 2,556 patents, which was given as one for every 1,717 inhabitants. Now it is probable that the population of the State by the census being taken this year will show an increase possibly as large as one million. This, of course, would materially change the proportions thus given, and from this kind of reasoning from deficient data, the proportion of patents to population has, for most of the last ten years, been made to appear larger in nearly all of the States than it actually has been.

CYPRIEN M. TESSIE DU MOTAY.

Mons. C. M. Tessié Du Motay, chemist and inventor, of Paris, France, died in this city, June 4, at the age of sixty-five.

Mons. Du Motay was born in Brittany, France, in 1815. At an early age he went to Paris, and after achieving considerable distinction in literature, he turned his attention to science and invention. His earlier successes were in connection with chemistry. While studying that science in Germany he invented and patented several improvements in the art of bleaching and dyeing, which brought him money as well as reputation. On his return to Paris he became distinguished as a consulting chemist and metallurgist. He invented a method of manufacturing ferromanganese, and introduced notable improvements in the manufacture of glass, in the treatment of beet sugar, in photographic chemistry, and in other departments of technology. He was one of the first experimenters in electric lighting with Jablochkoff, Moncel, and Jamin, and in connection with Maregnac he in-

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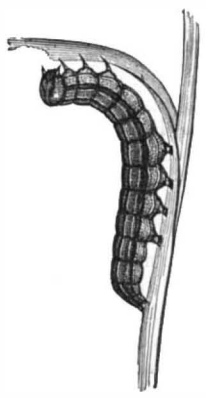
vented a process of producing oxygen cheaply for industrial purposes, and applied it in the manufacture of illuminating gas. At the time of his death he was engaged in introducing his system of gas making for the Municipal Gaslight Company of this city. During his residence here he has patented improved processes in mining and metallurgy; and in connection with M. Rossi, he developed last year the binary absorption system of ice making, illustrated in this paper February 21.

THE ARMY WORM.

This dreaded foe to grass and small grains has lately been doing very considerable damage along parts of the sea coast from Virginia to Long Island, and may be expected to appear in the New England States as the season advances. Accounts of its ravages are more particularly numerous in Delaware and on Long Island. The *Herald* of the 3d inst. has a long account of its injuries to rye.

This is one of the insects that, on account of wide-spread injuries at irregular intervals, and of its not being noticed by farmers during the intervening years, attracts more than usual attention, and, notwithstanding it had been written about by economic entomologists for many years, and especially since 1861, when we had a wide-spread visitation of it, yet its full natural history was first made known some four years ago by Prof. Riley, who published a complete account of it in his Eighth and Ninth Reports on the Insects of Missouri.



Full grown Army Worm.

Various caterpillars that, from excessive multiplication, occasionally move from field to field in large bodies, have been popularly called army worms, but the term belongs to this insect *par excellence*. Up to the year 1861 very little but that was inaccurate and confusing had been written about this insect, though it is referred to in Flint's Second Report on the Agriculture of Massachusetts, as occurring in millions as long ago as 1743. 1861 and 1873 were noted years of wide-spread injury.

WHERE THE EGGS ARE LAID.

The favorite place to which the female consigns her eggs is along the inner base of the terminal blades of grasses, where such blades are yet double, and on both the green and dry blades. In fact the dry blades are preferred, and occasionally the eggs are thrust in between the sheath and stalk. The female, says Prof. Riley, having once commenced to lay, is extremely active and busy, especially during warm nights, and but two or three days are required to empty the ovaries, which have a uniform development. A string of fifteen or twenty eggs is placed in position in two or three minutes, and by the end of ten more, the moth will choose another leaf and supply it with another string. The moth perishes within a day after having exhausted her supply of eggs. The egg is glistening white when first laid, and only becomes tarnished or faintly dull yellowish toward maturity.

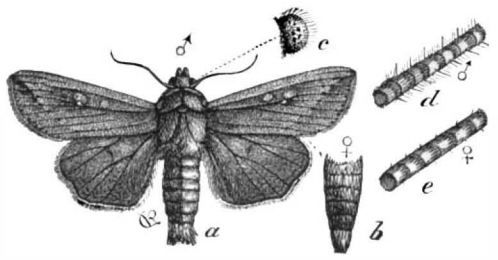
Chrysalis of Army Worm.

HABITS OF THE WORM.

As Prof. Riley well observes, the fact cannot be too strongly impressed on the mind, that the traveling of the worms in large armies is abnormal. During the latter part of April and throughout the month of May, in this part of the country, the worms may almost always be found by diligent search in moist grass land that was not cut or grazed too closely the previous autumn. At these times they have essentially the habits of ordinary cut-worms, and are seldom noticed unless so abundant as to cut the grass entirely down and be obliged to travel to fresh pastures. Indeed, one may pass daily through a grass plat where they abound, and never suspect their presence until the plat suddenly begins to look bare in patches.

The reasons why they so easily escape detection in this their normal condition is that, when less than half an inch long, the worms are scarcely recognizable as army worms, the characteristic dark, sinuous lines on the head being at this time obsolete, and the general color being pale green. The color is very variable at any stage of growth, and in some individuals the brown predominates while they are yet quite small; but up to the last moult the green generally prevails and the longitudinal dark lines are less conspicuous. The broad stigmatal line is the most persistent, being distinguished when the insect is one quarter inch long. The worms in this their normal condition feed mostly at night, and hide during the day at the base of the grass or under any other shelter at hand. If they venture to mount a plant and feed during the day—which they often do in cloudy weather—they drop at the least disturbance, and curl up in a spiral so as to simulate very closely a small shell of the *Helix* form. The worm loves cool, moist places, and is more often found around the margins of creeks and ponds than elsewhere. Last year, when the rains were so copious as to fill creeks and bottom lands and float numbers of the worms away, I saw many a one cling tenaciously to grass blades and continue feeding as though little concerned, even when partly immersed.

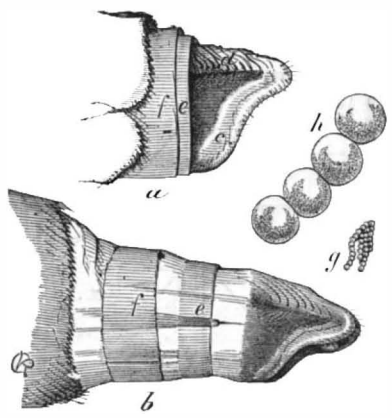
It is only when hunger impels them that they march forth from the fields where they were born, though after they have once begun the wandering habit they often pass through fields without eating everything to the ground. Invariably when the older individuals are attracting attention by congregating and traveling in armies, others may be found of all sizes in the more normal and quiet condition in grass that is yet sufficiently rank; they may indeed be found some time after the first worms have changed into moths; and the mower with his scythe often startles the moths in



ARMY WORM MOTH.—*a*, male moth; *b*, abdomen of female, natural size *c*, eye; *d*, base of male antenna; *e*, base of female antenna, enlarged.

numbers during the latter part of June, while yet the worms are clinging to the grass that he is cutting, or hiding in the stubble that he leaves.

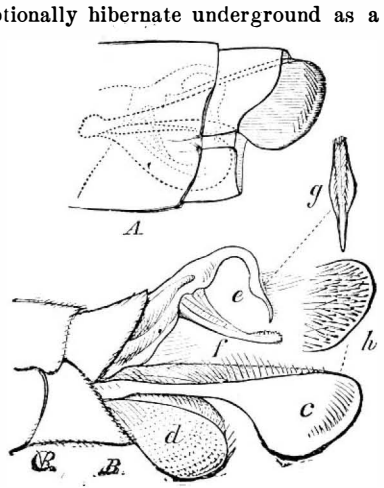
When traveling the worm "will scarcely turn aside for anything but water, and even shallow water courses will not always check its progress; for the advance columns will often continue to rush headlong into the water until they have sufficiently choked it up with their dead and dying bodies, to enable the rear guard to cross safely over. I have noticed that after crossing a bare field or bare road, where they were subjected to the sun's rays, they would congregate in immense numbers under the first shade they reached. In one instance I recollect their collecting and covering the ground five or six deep all along the shady side of a fence for about a mile, while scarcely one was seen to cross on the sunny side of the same fence."



ARMY WORM MOTH.—*a*, end of abdomen denuded and showing ovipositor at rest; *b*, same with ovipositor fully extended; *e*, *f*, retractile subjoints; *h*, eggs, all enlarged; *g*, eggs, natural size.

Though when hard pushed the worms will fall upon and devour each other, and will even feed upon some kind of vegetable, yet their attacks are mostly confined to the grasses and cereals, and their most natural food plants are the rank swamp grasses.

While in the more Northern States there is but one annual generation, there are at least two farther South. The insect hibernates in the perfect moth state, and is very frequently captured during mild weather of winter, especially in the Southern States. There is good reason to believe that it may exceptionally hibernate underground as a chrysalis.



GENITALIA OF MALE ARMY WORM MOTH.—*A*. end of body, denuded of hairs, showing the upper clasps protruding, and the natural position of the hidden organs by dotted lines; *B*, the organs extended.

The worm has numerous natural enemies, which pursue it remorselessly whenever it becomes unusually numerous, so that it very rarely, if ever, appears in destructive numbers for two years in succession.

REMEDIES.

Experience has well established the fact that burning over a meadow, or prairie, or field of stoppel, either in winter or spring, effectually prevents the worms from originating in such meadow or field. Such burning destroys the previous year's stalks and blades, and, as a consequence of what we have already stated, the nidi which the female moth prefers. Burning as a preventive, however, loses much of its practical importance unless it is pursued annually, because of the irregularity in the appearance of the worm and the difficulty of anticipating its coming. Judicious ditching, *i. e.*, a ditch with the side toward the field to be protected perpendicular or sloping under, will protect a field from invasion from some other infested region when the worms are marching. When they are collected in the ditch they may be destroyed either by covering them up with earth that is pressed upon them, by burning straw over them, or by pouring a little coal oil in the ditch. A simple plow furrow, six or eight inches deep, and kept friable by dragging brush in it, has also been known to head them off.

We conclude with the following summary of the natural history of this worm, given by Prof. Riley in an essay which obtained the Walker prize of the Boston Society of Natural History in 1877:

"The insect is with us every year. In ordinary seasons, when it is not excessively numerous, it is seldom noticed: First, because the moths are low, swift fliers, and nocturnal in habit; second, because the worms, when young, have protective coloring, and, when mature, hide during the day at the base of meadows. In years of great abundance the worms are generally unnoticed during early life, and attract attention only when, from crowding too much on each other, or from having exhausted the food supply in the fields in which they hatched, they are forced, from necessity, to migrate to fresh pastures in great bodies. The earliest attain full growth and commence to travel in armies, to devastate our fields, and to attract attention, about the time that winter wheat is in the milk—this period being two months later in Maine than in Southern Missouri; and they soon afterwards descend into the ground, and thus suddenly disappear, to issue again two or three weeks later as moths. In the latitude of St. Louis the bulk of these moths lay eggs, from which are produced a second generation of worms, which become moths again late in July or early in August. Exceptionally a third generation of worms may be produced from these. Further North there is but one generation annually. The moths hibernate, and oviposit soon after vegetation starts in spring. The chrysalides may also hibernate, and probably do so to a large extent in the more Northern States. The eggs are inserted between the sheath and stalk, or secreted in the folds of a blade; and mature and perennial grasses are preferred for this purpose. The worms abound in wet springs preceded by one or more very dry years. They are preyed upon by numerous enemies, which so effectually check their increase, whenever they unusually abound, that the second brood, when it occurs, is seldom noticed; and two great army worm years have never followed each other, and are not likely to do so. They may be prevented from invading a field by judicious ditching; and the burning over of a field, in winter or early spring, effectually prevents their hatching in such a field."

The Army Worm.

One notable feature of the present invasion is the origin of the swarms along the shores of the Sound and the ocean. For seven or eight years they have prevailed sparingly on the southeastern side of Long Island and probably elsewhere. For some favorable cause they have multiplied amazingly during the recent dry weather, and now they threaten to overrun not only all of Long Island, but also the shore counties of New Jersey and Connecticut. The invasion began about the first of June, on the farm of J. N. Plumb, near Islip, L. I., where a large area of young corn, rye, and wheat was soon destroyed. The corn was eaten off close to the ground. In the grain fields the worms crawled up the stalks and ate off the green leaves one by one, beginning at the outer end of the leaf on the under side and eating back to the stalk. Then the head was attacked, the worm nipping off the tip of each kernel and sucking out the juice. Grass, oats, clover, garden crops, and all succulent vegetation are taken as they come, the country ravaged being left brown and bare. A reporter on Long Island says: What was fresh green grass a week ago seems to the eye to have been burned by a drought. The ground is as brown as burnt sienna. The pedestrian walks on the roadside and feels the insects crush under his boots. When the sun's rays strike the worms they are, as if at a signal, at once on foot in brown masses that cover the ground. They cross the whitish road, and its dust is hidden. A carriage passes, and the wheels become as thickly incrusted with the slaughtered insects as they are with mud after a soaking rain has softened the roads. The worms crawl upon the fences and pass on exploring expeditions.

The movement of the worms in one corner of Mr. Johnson's field could distinctly be heard by leaning on the fence near by. The worms were in some rank blue grass. The column began at the fence, and almost in a straight line stretched out into the field. The march was rapid, and the grass was cut to the ground, which was covered already with multitudes pressing on behind. The sound was like the rustling of grass in a wind, only it was more continuous.

Many devices have been tried to stop the march of the pests. Some small grain fields have been in a measure protected by drawing back and forth across the grain long ropes to brush or jar the worms from the leaves and heads. Fire and boiling water have been resorted to with slight success. Ditches have been dug or plowed around threatened fields, but unless they are very deep, or the worms are constantly raked out or burned out with fire, they are soon filled up with worms, and the rest of the army goes on to complete the work of destruction.

Thus far on Long Island, the worms have ravaged a belt about two miles wide all along both shores, and are rapidly marching inland. They have just began their march in Connecticut, while in New Jersey the coast line is suffering as severely as the Long Island shores.

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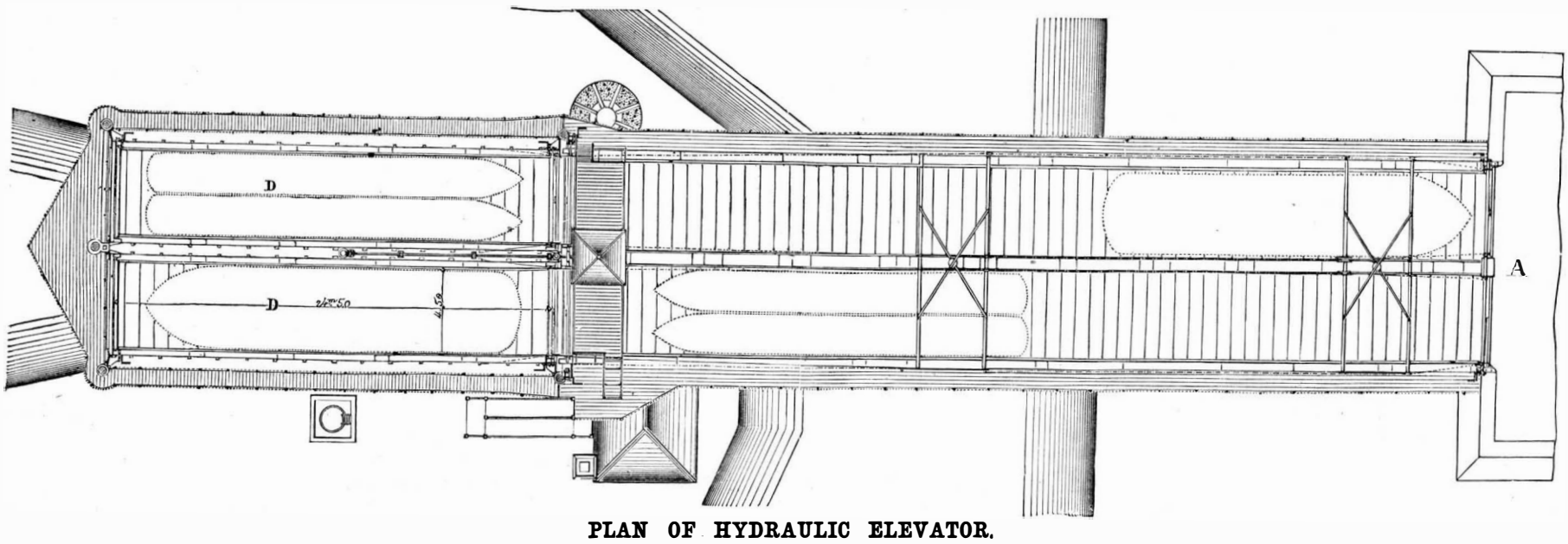


PLAN OF HYDRAULIC ELEVATOR.

MECHANICAL INVENTIONS.

DRY COPYING PROCESS.—After a somewhat lengthy litigation before the United States Patent Office, to determine the originator of the invention for producing multiple copies of writing, by what is known as the dry process, two patents have lately issued, which seem to vest in a German subject the authorship of the invention. The process has been so often described in this and other papers, we will not repeat the formula; but parties desiring to use the invention will gain all information by addressing the Hektograph Company, of this city. Copies of the patents may be had at the office of this paper at the usual charge.

Mr. George Lettenmyer, of Little Georgetown, W. Va., has patented an improved carpenter's work bench. This is an improvement in the class of work benches which are provided with a sliding dog or clamping jaw operated by a lever.

Messrs. William A. Branch and Edmund Golucke, of Crawfordville, Ga., have patented improvements in grinding mills of that form in which the runner-stone is provided with metal grinding surfaces arranged in the eye of the stone, so as to give a preliminary grinding to the grain near the center, where the leverage is greater, before being admitted between the stones.

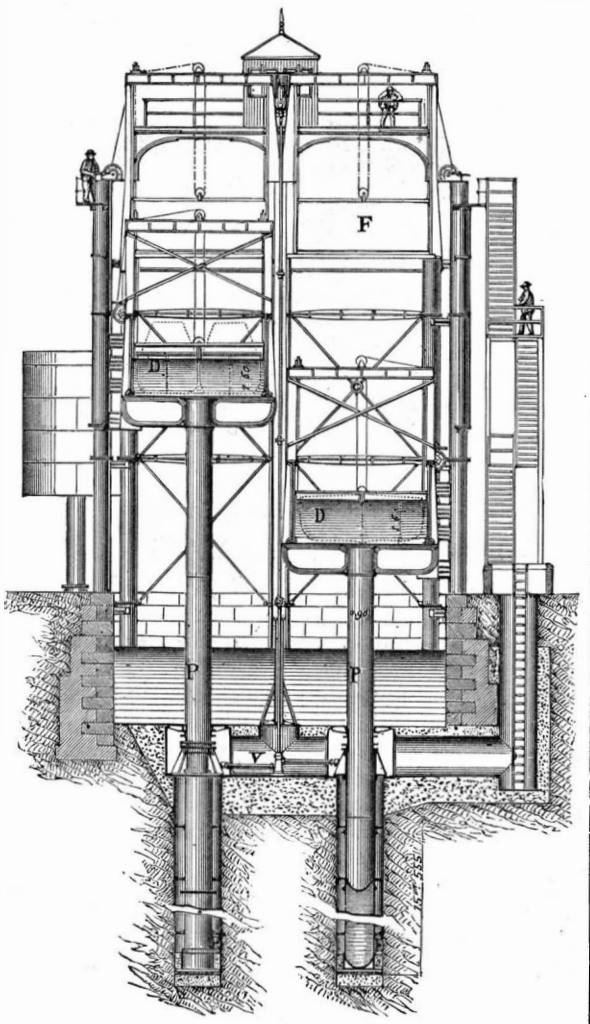
An improved roll for forming billets from steel railroad rails has been patented by Mr. Frank B. Davis, of Johnstown, Pa. The invention consists in constructing the rolls with a series of grooves, so formed as to gradually lower and thicken the web and fill out the angles between the web and the flanges and head, and then bring the rail into the form of two triangular parts connected by a thin web, and separate the two parts, forming two triangular billets.

An improved rotary pump has been patented by Mr. Erwin B. Newcomb, of Cumberland Mills, Me. The object of this invention is to construct a rotary pump in such a manner that the floats shall be balanced and operated by the pressure of the water acting through ports or channels formed in the cylinder heads, and communicating with the exit and entrance ports of the pump and with the radial float slots of the revolving cylinder.

An improved rock drill has been patented by Mr. George P. Schaurer, of Nashville, Tenn. The object of this invention is to provide a drill that will cut a perfect channel in the rock, and at the same time dress both faces of the said channel.

HYDRAULIC ELEVATOR FOR CANAL BOATS.

One of the serious defects of canal transportation is the loss in time caused by locking a boat from one level to another, especially if the height between the levels is considerable. Another is the great loss of water, which in many cases is a factor of the greatest importance. These and like difficulties have been overcome by means of a hydraulic elevator for canal boats, constructed by the engineers, Messrs. Edwin Clark & Sidengham Duer, in the Weaver, at Auderton.

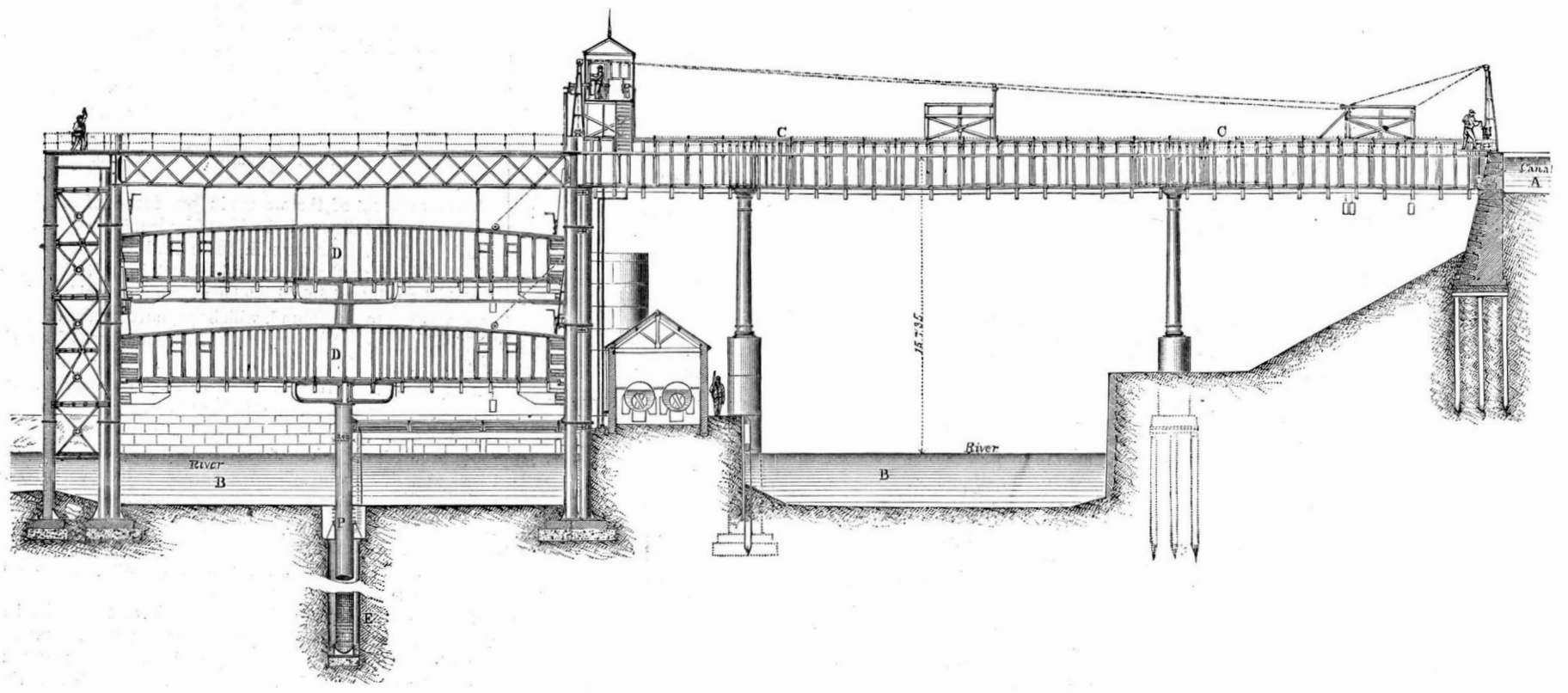


TRANSVERSE SECTION.

The annexed engraving, which we take from the *Annales des Travaux Public*, is an excellent representation of this elevator. The upper canal, A, is conducted directly over the lower canal, B, by means of a wrought iron aqueduct, C C, supported by iron columns, and provided with gates at the ends. The car or carriage, D, consists of an iron caisson, provided with iron sluice gates, and is centrally supported on a large iron casting, forming the upper extremity of the cast iron plunger, P, of a hydraulic elevator. This plunger passes into an iron cylinder, E, placed in the bottom of the lower canal, B, and is in communication with an Armstrong accumulator. The caisson is 80 feet long, 14½ feet wide, and the water in it is never permitted to rise higher than 5¼ feet.

The total weight of the caisson and the water contained in it is about 250 tons. The diameter of the piston is 35⅝ inches, and the height between the levels of the two canals is 50 feet 2 inches. The time and power required are greatly diminished by the use of two elevators. One large or two small boats are floated into each caisson, one of which is on a level with the upper canal, and the other on a level with the lower canal. The gates, F F, are then closed, and the level of the water in the upper caisson is raised about 6 inches. The valve, V, is now opened, placing the two cylinders in communication with each other. The upper caisson will now descend and the lower one will rise until the bottom of the lower one has arrived at the level of the lower canal, upon which the communication valve, V, is closed, and the valve admitting water under pressure, from the accumulator into the cylinder of the rising piston, is opened, and the rising caisson is raised to the level of the upper canal. The discharge valve of the cylinder of the descending piston is then opened, permitting the corresponding caisson to descend entirely into the lower canal, when the boats are floated out of the caissons.

A CORRESPONDENT, writing from near Leadville, Col., under date of June 1st, says they have just had a fall of eight inches of snow. He lives at a place 11,500 feet high above the sea.



HYDRAULIC ELEVATOR FOR CANAL BOATS.—CONSTRUCTED IN THE WEAVER AT AUDERTON, ENGLAND.

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IMPROVED STYLOGRAPHIC PEN.

For over two years fountain pens or ink pencils have been sold in this and other countries, and thousands have found them to be a very useful instrument. During this time many defects have been noticed and efforts made to overcome them, resulting at last in the production of the newest and latest pen of this kind, which was patented March 9, 1880.

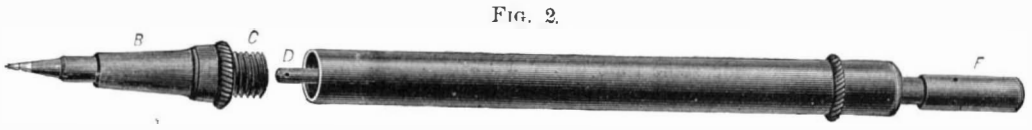
The pen consists of an ink holder of vulcanized rubber, ornamented and beautifully mounted. The ink is conveyed by capillary attraction to the tubular point, containing a solid iridium-pointed needle. It combines all the advantages of pencil and pen, and is a great saver of both time and patience.

Fig. 1 shows the pen complete in its new form. Fig. 2 represents the point section removed ready for filling. Fig. 3 shows the new and late improvements, the duplex, interchangeable point section. The advantages of these improvements are at once apparent. If by any accident the pen point should break down, a new one could be obtained at a small cost. Two points can be had with each pen for fine and coarse writing. The needle by being detached from the air tube, D, cannot become bent or broken while filling the pen, but is always protected by the section, B. The new pen has the delicate spring on the end of the needle completely covered, thus effectually preventing oxidation, a source of constant annoyance in those of earlier make.

Further information may be obtained from the Stylographic Pen Company, office No. 169 Broadway, Room 13, New York.

FIG. 1.

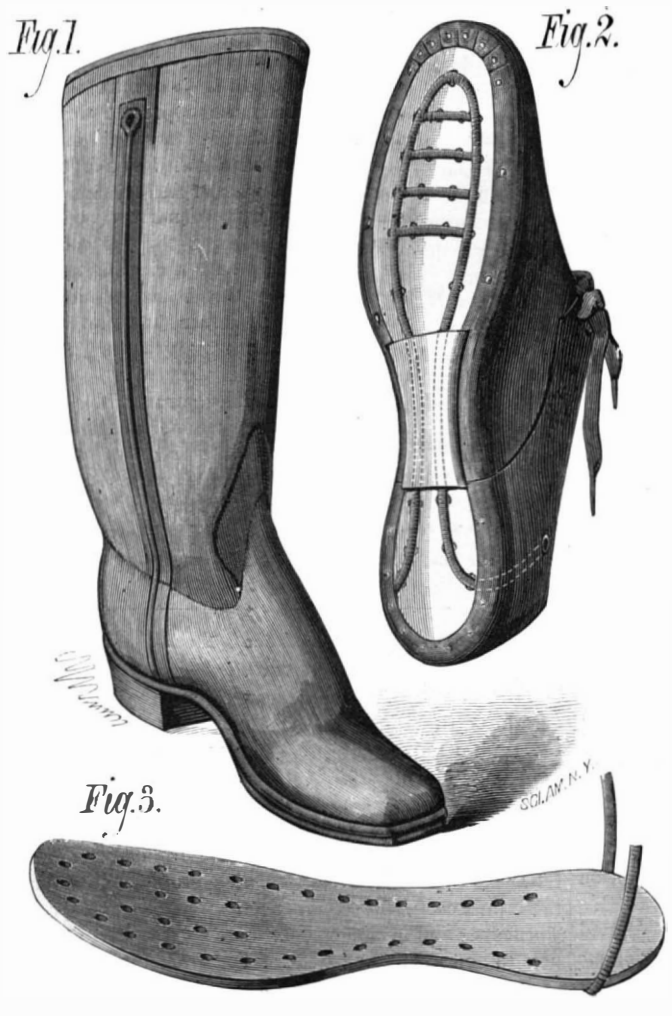
FIG. 2.



NEW STYLOGRAPHIC PEN.

VENTILATION OF BOOTS AND SHOES.

It is a matter of the most common every-day experience that in the wearing of boots and shoes, and especially those made of rubber, the feet sweat and heat almost continually in cold weather, making the feet clammy and cold, and inducing chilblains, and in warm weather, with the best precaution, exceedingly noxious. It is doubtless the cause of much of the rotting and breaking of uppers, and is, above all, an exceedingly unhealthy feature of the present method of dressing the feet. Attempts have heretofore been made to obviate this in a number of ways, for instance by inner soles of different kinds intended to absorb the moisture; and unsuccessful efforts have also been made to ventilate the boot or shoe. Every person feels the need of something that will satisfactorily accomplish this object. The accompanying engraving illustrates a recent invention which does this effectually, and is an exceedingly simple device. It consists of a spiral coiled brass wire, laid in a groove extending in and around the under side of the insole of the boot or shoe, with holes punched at close intervals, immediately over the coil. The coil is extended along to the heel, and carried to the top, where it stops at an eyelet hole, forming, when walking, a complete automatic air pump, continually drawing in pure air and throwing off the foul and heated air.



BOOT AND SHOE VENTILATOR.

The inventor states that the invention stands a practical test, successfully ventilating a boot or shoe, and it is an especial benefit to rubber goods, which, as at present worn, are peculiarly destructive to the feet. Its application is inexpensive and will not materially increase the price, and it is claimed that its use will be economical, as it prevents the breaking of the uppers where they join the sole.

There can be no question that the unhealthy condition of the feet induces many of the diseases and ailments with which we are afflicted, and the sanitary and health preserving features of the invention are among the first that recommend it to universal use. It insures economy, personal comfort, and health above all, and will undoubtedly become an article of every-day wear as soon as it is properly presented to the public. We learn that contracts are now being made with large manufacturers to introduce it in their goods. It was invented and patented by D. A. McDonald, a practical shoemaker, and is now owned and controlled by the McDonald Boot and Shoe Ventilating Company, of Rockland, Me.

FIG. 3.

A Glycerine Barometer.

A glycerine barometer has been suggested by James B. Jordan, of London, and is being tested at Kew. The cistern is a cylindrical vessel of copper lined with tin, five inches deep and ten inches in diameter, fitted with a screwed cover, the air having access through a small hole in the cup attached to the cover, which has a recess holding cotton wool for filtering out the dust. The main tube, twenty-seven feet long, is connected with the cistern by attachment (with a soldered joint) to a projecting piece of tube which enters the cistern through the bottom, and is fitted at its opening with a screwed plug. The tube is an ordinary piece of metal gas pipe five eighths inch in diameter, furnished at the top with a gun-metal socket, into which is cemented a glass tube four feet long, with an inside diameter of one inch, terminating in an open cup, and fitted with an India-rubber stopper.

The fluctuations of the level of the column of glycerine are observed and read off on brass scales placed on either side of the tube, and fitted with indices and verniers moved by mill heads at the bottom of the scales. One of these scales gives the length of the column of glycerine, the other the corresponding length of a column of mercury. A variation of a tenth of an inch in a mercurial column is shown by a change of more than an inch in the glycerine column, and the latter is therefore expected to show minute variations which are imperceptible in the former. Glycerine absorbs moisture freely when exposed to the air, but this is prevented in the new barometer by covering the exposed surface in the cistern with a layer of heavy petroleum oil specially prepared.

Arsenical Poisoning.

A recent number of the *Neue Freie Presse*, of Vienna, gives, on the authority of the *Berliner Börsen Courier*, the following account of arsenical poisoning through a dress: A certain Commerzienrath L—— brought home for his daughter from a well known Parisian *atelier* a splendid dark-green dress trimmed with light-green leaves. The dress was frequently worn, but, after a time, the lady, who had a very beautiful complexion, remarked an outbreak of pustules on her neck and arms, which was especially painful at night. For a long time she concealed her state from her parents and the family physician, but after applying in vain all kinds of domestic remedies, she could no longer keep the matter secret, as she had become much worse. The family doctor at once recognized the effect of arsenical poisoning, and on chemical examination detected a large percentage of arsenic in the material of the dress.

Spontaneous Combustion.

Some experiments made at Riga with reference to the spontaneous combustion of various materials, wadding, raw flax, hemp, the waste of silk, wool, and cotton spinning, also sponge, as well as the wood dust found in the cabinet-makers' shops, appear to demonstrate the important fact, among others, that small quantities really take fire sooner than large ones. The substances named were saturated with various fluids—oils, turpentine, petroleum, various varnishes, etc. All the fibrous materials took fire when saturated with any of these oils, or with mixtures of the same; sponge and wood dust, on the contrary, proved to be entirely harmless. Combustion ensued most rapidly with seventeen grains of wadding and sixty-seven grains of a strong oil varnish, namely in thirty seven minutes; while two hundred grains of washed cotton waste, of which a portion was saturated with seven hundred and fifty grains of strong oil varnish and the remainder wrapped about it, required a period of well-nigh fourteen hours. On these materials being placed in a well-sheltered spot and subjected to a heat of from 18° to 40° C., silk did not flame up, but slowly charred: and, as already mentioned, small quantities seemed to take fire sooner than large.

PRICE INDICATOR FOR GAS METERS.

A gas meter is by no means a very difficult instrument to understand, yet the majority of gas consumers are unable to tell how much gas has been consumed by an examination of the meter, and the consequence is that disputes frequently arise between the gas manufacturer and the consumer, which might be entirely avoided if some means were provided which would enable the gas consumer to tell at any moment just how much is due the manufacturer.

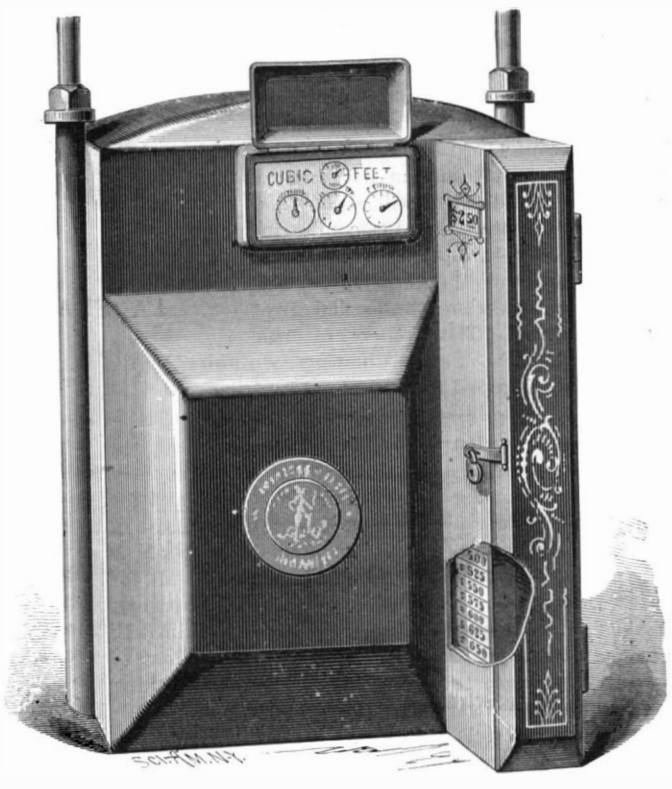
Mr. Frederic Egner, of Norfolk, Va., has recently patented a price indicator for gas meters which obviates difficulties of this nature, and always shows in dollars and cents the amount due for gas.

The invention is very simple, and may be applied to meters already in use, or it may be made a part of a new meter. It consists of an endless band having printed on it figures representing dollars and cents advancing regularly in some fixed ratio. This band is mounted on two rollers in an auxiliary case attached to the meter case, and is driven by a simple train of gearing from the "hundred" pinion of the registering mechanism.

The gas consumer may at any time know how much he is indebted to the gas manufacturer by noticing the figures visible through an opening in the case containing the endless band. The meter inspector carries a key to the case containing the band, and the latter may at any time be turned back to the zero point by loosening the lower roll, and should the scale of prices be changed a new band may be supplied at a trifling expense.

This invention is well calculated to settle many of the disputes arising between the gas consumer and the gas manufacturer, and it affords an effectual check on meter inspection, insuring correct statement.

This useful improvement is the invention of Mr. Frederic Egner, of Norfolk, Va., who may be addressed for further information.



EGNER'S PRICE INDICATOR FOR GAS METERS.

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Lunar Caustic for Purifying Spirits.

Although some sorts of spirits are associated in our minds with lunatics, and others with "moon-shiners," the subject of which we are about to speak is of a quite different nature, being at once scientific and practical.

Berlien has discovered the fact that raw spirits can be purified by treatment with a solution of nitrate of silver and subsequent rectification. From two to two and a half parts of dry nitrate of silver are sufficient for one million parts of crude spirits, a ten per cent water solution being employed. The odor is entirely removed from the worst quality of crude spirits by this infinitesimal amount of silver; a good quality of raw spirits requires correspondingly less, and a one per cent or a one-hundredth per cent solution of silver is then employed.

IMPROVED STEAM BOILER.

The boiler shown in the annexed engraving is intended to accomplish three very important results: First, the rapid generation of steam by a complete exposure of the water to the action of the fire; second, to superheat the steam by forcing it into contact with the smoke flues through narrow openings; and third, to prevent the destruction of the upper ends of the flues by cooling them with the moisture carried up by the steam.

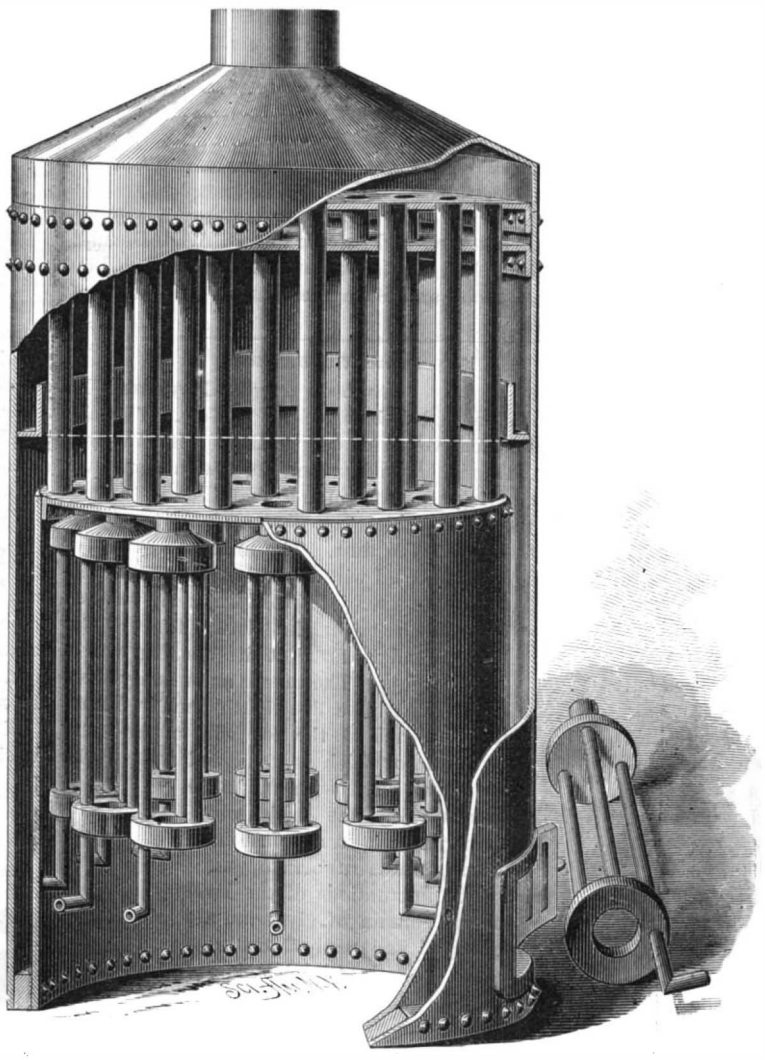
To accomplish the first result a series of flues are arranged in clusters in the fire box, as clearly shown in the engraving. These clusters, generally composed of nine tubes each, are each joined to a single tube passing through the crown sheet. By this arrangement a great extent of water surface may be exposed to the heat without obstructing the smoke flues or taking up a great deal of the crown sheet surface. A circulation is maintained through a tube connecting the lower end of the cluster with the water-leg of the boiler.

It will be noticed that near the upper head of the boiler there is a horizontal partition dividing the steam room of the boiler into two portions, the upper portion being the reservoir for dry steam. The apertures through the horizontal partition are a little larger than the flues, so that the steam in passing to the upper compartment of the boiler is brought into close contact with the flues and superheated. This not only relieves the steam of all superfluous moisture, but it tends to preserve the flues by preventing overheating.

This boiler presents a large and efficient heating surface, and it has, without much additional cost, a superheater which will always supply dry steam.

Between the horizontal partition and the tube sheet a ring of L-shaped cross section is attached to the inner surface of the boiler shell, forming a receptacle for mud and other impurities in the water, which are carried upward by the natural circulation of the water, and which, in boilers of ordinary construction, find their way to the water-leg, impeding the generation of steam and working destruction to the boiler

The inventor informs us that he can generate 100 lb. steam pressure in five minutes with this boiler, and that it will rapidly and economically generate steam for continuous work. The boiler is especially adapted to steam fire engines and other forms of portable engines where both compactness and great power are required. These boilers are made by the La France Fire Engine Company, of Elmira, N. Y., who should be addressed for further information.



LA FRANCE'S PATENT STEAM FIRE ENGINE BOILER.

Tree Culture on Waste Land.

Hitherto the abundance of natural timber in this country has made it easy to dispense with timber culture, and for the most part our land owners have taken little interest in such slow-growing crops. This state of things, however, is rapidly passing away. The demand for special woods for manufacturing purposes is steadily and rapidly increasing, while the natural supply is diminishing and must ultimately become quite inadequate. Meantime there are millions of acres of land suitable for timber culture and for nothing else, except poor pasturage that our land owners are allowing to lie waste and idle for lack of a little forethought, and too frequently our would-be thrifty farmers will risk their surplus means in wild-cat speculations, promising but never yielding large and speedy returns, when the same money spent in planting timber would soon convert their worthless swamps and stony places into valuable properties.

A correspondent, writing from Wisconsin, tells of a piece of land that was planted with walnut twenty-three years ago. The land was flooded every spring and summer, and was unfit for any ordinary cultivation. The trees are now from sixteen to twenty inches through, and have been sold for $27,000. No particulars are given as to the cost of planting the grove or the amount of attention it has had during the years of growth. There can be little doubt, however, that the investment was small in comparison with the return, and the land would otherwise have remained entirely unproductive. To the country the timber crop was so much clear gain. It is clear that our national resources might be enormously increased by a similar utilization by timber culture of lands which are now left unused and unproductive; and the planters would find their groves a surer investment for the security of their family possessions than any savings bank deposit.

Photozincotypes.

In Moll's *Notizen*, Herr J. Husnik writes as follows on photozincotypes with a sensitive asphalt solution:

We have at last reached the point of a more intimate knowledge of asphalt, and have thereby obtained a correct explanation of many of its properties hitherto kept secret.* It appears that by treating this substance with ether certain less sensitive components are removed, so that a residue "insoluble in ether" is left, which possesses in a considerably higher degree that sensitiveness to light so much desired in order to render the asphalt process practically useful. The way in which asphalt manifests its sensitiveness to light consists in becoming insoluble, or difficult of solution in its usual solvents, after exposure. Thus, a zinc plate, coated with an asphalt solution, which has been exposed for some time under a linear negative, may be developed by spirit of turpentine, so that all the whites dissolve while the lighted parts remain undissolved. And if, after fully developing, the zinc plate be washed first with spirit and then with water, and now allowed to become perfectly dry, the operation of etching may at once be begun; but, as such a plate had formerly to be exposed for hours in the sun, and for days—in winter even for weeks—in the shade, in order to get a good picture which could be developed with turpentine, it was not possible to turn the process to practical account. Gillot, Yves, and Barret, and other firms in Paris have, however, employed the asphalt process for years, but the secret of the greater sensitiveness of their solution was never known.

In Switzerland and America also one often heard of the asphalt process being employed for zincography, and, as already mentioned, the veil has now been torn from the secret. We know at last that progress in this process is to be sought in the direction of elimination from the solution of the insensitive particles.

Such a sensitive solution can, when requisite, be diluted with a little anhydrous benzole (not benzine, in which asphalt is insoluble). Benzole which contains a little water cannot be used either, as in drying it would cause the asphalt solution to wrinkle up and would not furnish an equal surface.

The solution must be kept perfectly free from dust. Before being coated the zinc plate should be carefully dusted, and any excess of the coating solution should be poured off into another vessel, and not back into the stock bottle until it has stood to settle for a couple of days, after which the upper part may be poured back. When the film has become dry it may be slightly warmed and then exposed under a clear line negative—preferably in the sun, as then only half an hour of an exposure is required. The plate is now laid in a bath containing oil of turpentine, and when the image has become visible the denser portions may be gone over with a small soft pencil, so that they may be developed at the same time as the lights.

When the shadows appear sufficiently clear, remove the plate and coat it with alcohol or place it in a bath containing alcohol, and when the oil of turpentine has been partially washed out, place it under a jet of water falling from a certain height, so that the water may come in contact with the whites and remove any oil of turpentine that might still be adhering to them.

The development is an operation requiring great care and rapidity of work, which can only be learned by practice. The plate, being well developed, is next warmed, and when it has cooled again the next stage is the etching. Should the shadows, however, not be deep enough, they should be gone over with a pencil dipped in oil of turpentine, and when that has been allowed to act for a short time the whole plate should again be washed in the above mentioned turpentine bath, and the procedure with the alcohol bath and the water tap repeated. This plan gives sharp pictures, and may be used with advantage for much reduced reproductions of woodcuts.

* Dr. Kayser's examination of the properties of asphalt.

ENGINEERING INVENTIONS.

An improved scow, from which the load can be dumped conveniently and rapidly, has been patented by Mr. John R. Knuth, of New York city.

Messrs. William H. Burden and Frederick C. Burden, of Cleveland, Ohio, have invented an improved car axle journal oiler which is simple and effective. It consists of two conical wheels connected by a square shaft, and pressed against the journal by a spring contained in the journal box. An endless chain is suspended from the shaft and extends into the oil in the journal box.

Mr. John U. Mueller, of Detroit, Mich., has patented an improved jetty shutter. The invention consists of one or more rows of piles, driven some distance apart somewhat back from the line of breakers and on the line of the intended improvement, said piles being securely connected some distance above water level with longitudinal beams, and further stiffened and secured by braces and ties, while fastened to the inner longitudinal beams are the shutters, which are intended to form a settling basin for the mud, sand, clay, gravel, etc., driven by the waves toward the shore.

Messrs. William P. Woodruff and Charles H. Woodruff, of New York city, have patented an improved elastic packing for piston rods and other rods that slide through stuffing boxes. It is so constructed as to retain its elasticity when pressed down by the gland. It is formed of a central core of metallic turnings, surrounded by a layer of cloth and alternate layers of anti-friction metal and brass in the form of narrow strips wound spirally upon the cloth-covered core, and in the combination, with such packing rings, of an anti-friction metal seat, having a large ring groove in its upper side and two or more small concentric ring grooves in its lower side.

Mr. Eugene H. Angamar, of New Orleans, La., has patented a boiler adapted for application to horse cars now in use, so as to utilize such horse cars without material changes. The invention consists in a boiler made in two portions, separated by a mediate chamber, the water and steam spaces of the parts being connected by pipes.

Astronomical Items.

A writer in the Providence *Journal* says: If the planet Neptune was discovered or supposed to exist on account of certain perturbations in the movements of Uranus, and if the erratic movements of Mercury reveal the presence of planets within his orbit, why should not the near approach of Jupiter to the sun stir up a commotion in his fiery elements? The sun is still diversified with spots, and the planet is near enough to perihelion to make his influence felt. Astronomers have been wise prophets thus far as to the influence of the commencement of the sun-spot cycle. Tornadoes and cyclones of extreme severity have borne witness to abnormal conditions of the atmosphere, and a wave of intense heat, such as has not occurred for a quarter of a century at this season of the year, has confirmed the exactness of previous observations. We must still expect the usual storms, waves of heat, and auroral displays that follow the maximum of sun spots; we have yet to learn whether the coincident perihelia of the four great planets will increase and prolong the elemental warfare. This is one of the most interesting problems of the day, as well as one of the most practical and important. It will not meet with a hasty solution, for the period of observation extends to the year 1885.

The June moon fulls on the 22d. The morning sky of the 2d will show a lovely picture of the waning crescent of the old moon, near to the brilliant Jupiter and his less distinguished rival Saturn. On the 6th, one day before her change, she will be near Venus.

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The new moon of the 7th will be near Mercury on the 8th, Mars on the 11th, and Uranus on the 14th; and the waning moon on the 30th will again pay her respects to Jupiter. On the 22d there will be a total eclipse of the moon, which will be invisible in this portion of the globe, but will be partly visible in the Western part of the United States, and entirely visible in the Pacific Ocean.

Correspondence.

What is the Temperature of the Sun?

To the Editor of the Scientific American:

The voltaic arc affords a very ready means of comparison. The intensity of light in a good arc is fully equal to that of the sun. Therefore, the temperature of the sun is not greater than that of the arc.

The temperature of the arc is not greater than 60,000° Fahr. Therefore, the temperature of the sun is not in excess of 60,000°; and those who have estimated into the millions have gone very wide of the mark. Rossetti's estimate of 20,000°, and Spoerer's of 27,000°, are nearer the point.

The light, and consequently the heat, condition of the sun can be very closely imitated in the incandescent electric light, whose temperature can be closely calculated. The voltaic arc emits light by reason of the incandescence of minute particles of carbon passing between the electrodes. In the incandescent light, so-called, the carbon is a solid mass. The dissociated particles of carbon in the arc are much more highly heated than the particles of the solid incandescent pencil, but the latter is homogeneous, and therefore more like the sun. To bring a carbon pencil to that point of incandescence at which it acquires the intense limpid appearance of the sun, no longer seeming an opaque mass but seeming transparent, it is necessary that the pencil should be heated above 12,000°. It is a veritable miniature sun, so far as the heat condition is concerned. Under no circumstances can its temperature exceed 50,000°, and the pencil even temporarily remain a solid; and even at the lower temperature volatilization occurs. Therefore, the temperature of the sun is not less than 12,000°, nor more than 50,000° Fah.

There is another way of arriving at the result:

The diameter of the sun is said to be 800,000 miles. The earth is said to be 95,000,000 miles distant from the sun. The diameter of the earth's orbit is therefore 95,000,000 + 800,000 + 95,000,000 miles, or roughly, 190,000,000 miles. The heating surface of the sun is represented by a sphere 800,000 miles in diameter, and if we imagine the diameter of the earth's orbit to be that of a hollow sphere surrounding the sun (its inner surface situated 95,000,000 miles from the source of heat), we can approximate very nearly the difference in the degree of heat where we are and at its source. As the diameter of the sun is contained in the diameter of the earth's orbit 237·5 times—as the heat of the entire surface of the sun is distributed over a space (the space of the surface of an imaginary hollow sphere having a diameter equal to that of the earth's orbit) 237·5 times the surface of the sun—it follows that the heat of the sun at the sun's surface must be 237·5 times as great as it is at the earth's surface; and if we assume a mean of 100° at the earth, the temperature of the sun must be 23,750°, no more nor less, and this corresponds very nearly with what I have observed in electric temperatures. W. E. SAWYER.

New York, June 5, 1880.

[NOTE.—Recent comparative photometric experiments between the light of the sun and the light of the electric arc show that the latter has a yellow tinge, the sunlight a purplish hue. This would afford ground for the inference of a higher temperature for the sun than that yielded by the electric arc.—EDS. SCI. AM.]

On a New Sytem of Photography.*

BY L. WARNERKE.

When experimenting with various phosphorescent substances it occurred to me to apply it to photography, and the following are the results obtained up to the present moment:

I prepare a phosphorescent plate, either rigid or flexible, by applying phosphorescent sulphide of calcium, either in the form of paint or powder, to the surface of glass or paper. The coating must be very smooth and uniform. Several substances can be used to cement the powder. Balmain's paint answers fairly well, but I suggest that albumen may be found more suitable, because it forms, when mixed with phosphorescent calcium, a coagulum which protects the phosphorescent material from the destructive action of the atmosphere (carbonic acid and moisture) more effectually than anything else.

A glass may be coated with collodion and a luminous surface formed on it. The film may be stripped off, and this will be found to be the best process by which to produce a smooth plate.

The plate so prepared, and previously kept in the dark, is inserted in the dark slide and exposed in the camera. After exposure it is removed to the dark room and put in contact with a sensitive collodion or gelatine dry plate. After suitable exposure by contact the sensitive plate can be developed and gives, as the result, a negative with perfect gradation, but reversed.

Theoretically, instantaneous exposure in the camera should be sufficient to give the requisite impression to the phosphorescent surface; and, if this surface could be produced sufficiently fine and smooth, it would be so practically. However, a few seconds' exposure with bright light is sufficient to render the luminous image easily discernible in the dark.

There is, besides this, the means of allowing a great range of exposure in the camera; since if the luminous image be not strong enough, prolonged exposure of the sensitive plate in contact with it will correct the shortcoming. By warming the plate bearing the luminous image the luminosity will instantly be increased, and there will be a corresponding effect on the sensitive plate.

The luminous impression, as shown in my previous paper on actinometers, is persistent, and this allows several negatives to be obtained from one luminous plate. By this means it is observed that contact printing is unsatisfactory for want of, or by too much, exposure; it can easily be remedied without the necessity of giving another exposure in the camera.

There is, however, a certain particularity which must be taken into consideration—the luminous image is not sharp. I repeated my experiments in regard to this fifteen times, and I came to the conclusion that the phosphoro chemical focus is far away from the corrected focus of our lenses.

When once impressed the plate will remain luminous for many hours; but the luminosity can be extinguished by exposing it again to the light filtered through certain colored transparent media. Respecting this I may remark that the most suitable extinguishing substance can only be found by actual experiment. I had several sorts of red and ruby glass, and only two of them acted as an extinguisher, but required an exposure of ten minutes to the sun's rays.

I found a green aniline color dissolved in collodion or gelatine more serviceable. The exposure of two minutes to diffused daylight was sufficient to complete the extinction. Strange enough, I have green glass of exactly the same green color, but it does not act as an extinguisher.

I may mention here that by exposing the phosphorescent plate behind a negative a negative luminous image is obtained, which can produce a positive on the collodion sensitive plate put in contact with it, and in this case it will be quite sharp.

If the phosphorescent plate be exposed to the light, and then put in contact with a negative covered with an extinguishing medium, and again exposed to the light, the opposite result to that previously described will be observed.

By using a phosphorescent plate it is possible to obtain a photograph of the red end of the spectrum. To do this the plate is exposed entirely to the light; and when the spectrum is projected on it the rays of low refrangibility will extinguish the excited luminosity of the plate, leaving the lines of the spectrum luminous. This is printed on the gelatine or collodion plate.

The negative passed round for inspection was made under the following conditions: The phosphorescent plate was exposed in the camera for one minute, using a rapid rectilinear lens. The light was of medium quality. A gelatine plate was put in contact with the luminous image for five minutes.

* A communication to the Photographic Society of Great Britain.

AMERICAN INDUSTRIES.

[*Continued from first page.*]

establishment, and conveys a good idea of the activity prevalent here. The experimental work is carried on in the laboratory, which is fitted with all of the modern appliances for making electrical tests, and with a full line of chemical and physical apparatus. The machine work is all done in a machine shop covering an area of 80 x 120 feet, well stocked with machinery from the shops of the best makers in this country.

The wire used in winding the armatures and magnets is all covered by a simple machine shown in one of the views in our engraving. The same view represents the machines on which the armatures are wound. The machines and lamps are all thoroughly tested before being shipped.

The carbon rods used in the Weston lamp are all made here, the company having determined by careful tests that their own carbons are better than the French. The operation of making the carbons is very simple; the retort carbon, being ground to an impalpable powder, is mixed with a moistening liquid and forced by hydraulic pressure through a die, which gives them their cylindrical form; they are then baked for a number of hours at a high temperature, and after cooling are inspected and pointed for use.

The manufacture of electric lighting apparatus is now one of our leading industries, and it is likely to expand as the advantages of this system of illumination become better known.

The new works of the Weston Electric Light Company are located at 23 to 29 Plane street, Newark, N. J., and their New York offices are located at 92 and 94 Liberty street.

MISCELLANEOUS INVENTIONS.

Messrs. Lewis H. Raymond, of New York city, and John Roberts, of Dunellen, N. J., have patented a life raft made with sides of equal height below and above the floor, and having independent cylindrical air chambers fastened thereto between the seats above and below the floor, and also having air chambers, made in compartments, formed between the sides at both ends of the raft. The gunwale on the top and bottom of the sides and thwarts is held and braced by means of braces connecting the gunwale and the thwarts.

Mr. Christian J. B. Hirsch, of Zumbrota, Minn., has patented an improved pipe stem. The object of this invention is to furnish a short pipe stem which shall have the effect of a long one, cooling the smoke and allowing the nicotine to condense from the smoke.

An improved hanging lamp, patented by Mr. Otto F. Eichberg, of New York city, consists in combining with a cup perforated at the top, and forming an extension of the tube, an adjustable extension having an interior depending flange and exterior absorbent.

Mr. John S. Birch, of Orange, N. J., has patented a novel key ring, so constructed that keys and other articles can be conveniently placed upon and removed from it, and which will not be liable to become opened accidentally. The invention consists in constructing the key ring of a strip of metal bent into V form, with rounded angle, having its end parts bent inward and outward to form shoulders, having one of its ends longer than the other and bent into U form, and having a lug upon one end and a recess in the other end.

Mr. Augustus J. Kuhn, of Lewistown, Pa., has patented an improved drying apparatus, intended more particularly for drying sand, which, by its peculiar nature, is difficult to dry and inconvenient to handle; but this improved machine may be used to advantage in drying any material that will run through the machine. The principal objects of the invention are, first, to permit the use of exhaust steam for producing the drying heat; second, to save handling of the material from the time it is placed in a wet condition in the machine to its delivery in a dry condition; and, third, to permit the regulation of the feed and delivery according to the heat and condition of the material and to prevent clogging of the feed.

Mr. Jesse M. Harr, of Baltimore, Md., has patented improvements in that class of skylights which are made strongly and studded with thick glass disks and placed in the sidewalk for the purpose of illuminating the dark recesses of a cellar or vault without allowing the entrance of rain and without breaking up the continuity of surface or weakening the pavement at such points.

Mr. John F. Henderson, of Franklin, Ky., has patented an improved coffeepot designed to more thoroughly extract the strength of the coffee and without boiling. A pendent cylindrical water receptacle is placed in the top of the pot, and is provided with a straining sack below, in which is contained the ground coffee.

In preserving fruit, vegetables, and meats by what is known as the "refrigerating" process, a current of air of reduced temperature is, in many instances, forced into and through the chamber or receptacle containing the substances to be preserved. In other cases the air is drawn from a well or through a tube passing through a collar, the current being established and maintained by the rarefaction of the air in the preserving chamber. Mr. Louis G. Volkmar, of New York city, has patented a portable apparatus for use in drying fruit, etc., by means of a cold air current, which is conducted through a tube that traverses an ice box, and is so arranged therein that ice may be packed around and in contact with it.

Mr. Charles E. Wallin, of Salt Lake City, Utah Ter., has patented a horse cover or blanket which affords greater protection than the ordinary blanket to the breast and other parts of the body, also be more comfortable to the animal by allowing greater freedom of movement, yet less liable to rip or tear or become displaced when the animal lies down or gets up. These results are attained by the provision of a detachable breast piece, elastic straps, a pad, and gussets or gores attached to the body of the cover.

Mr. James R. Barry, of Yonkers, N. Y., has patented a novel top, so constructed as to contain the cord when not in use.

An efficient and powerful implement for raising stumps, roots, rocks, and other objects, has been patented by Mr. William H. Wright, of Belmont, N. H. The invention consists of a vertical U-shaped frame in which moves a ratchet bar, the frame being provided with a lever for lifting the ratchet bar, a latch for retaining the bar at the point to which it is lifted by the lever, and springs for throwing the latch in and out of engagement with the ratchet bar.

Mr. Leroy Brown, of Waitsburg, Washington Territory, has patented an improved sulky plow which is so constructed that it may be readily adjusted and controlled by the driver. It is simple in construction, strong, and durable.

Mr. Thomas Bickerton, of Lawrence, Kan., has patented a hand corn planter with a drop slide which will accurately drop the corn. The end plates are shaped so as to prevent dirt from getting between them when thrust into the ground.

Mr. William Lay, of Seneca City, S. C., has patented a cheap, simple, and powerful water motor for running machinery or performing other work. It can be operated with a small quantity and with but slight fall of water.

New York Elevated Railway Cars and Engines.

The total number of engines now running is 167, divided as follows: Second avenue line, 29; Third avenue line, 68; Sixth avenue line, 46; Ninth avenue line, 24. The cars as follows: Second avenue, 66; Third avenue, 221; Sixth avenue, 152; Ninth avenue, 49. Total, 488. The combined mileage of the Eastern Division is about 269,400 miles; of the Western Division, about 146,000. Total mileage per month, 515,400 miles. These engines make two and a half stops to the mile, making an average of over one million train stops a month.

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IMPROVED BRICK MACHINE.

In the manufacture of bricks, a class of machinery is required which will not only turn out bricks perfectly and rapidly, but will also be capable of resisting the wear and strain naturally coming on such machines, and be entirely free from liability to disastrous breaks.

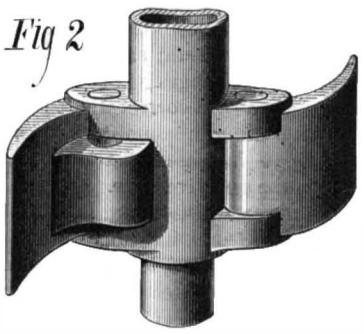
Mr. W. E. Tallcot, of Croton Landing, N.Y., the inventor of the machine shown in the annexed engraving, having had many years of practical experience in the manufacture of bricks and brick-making machinery, and having seen the defects of former machines, and knowing the requirements of a really good brick machine, invented, patented, and perfected a very successful machine, provided with safety devices at every point where breakage would be likely to occur. Mr. Tallcot being located on the Hudson River, in the great brick-making center of the United States, has had excellent opportunities for studying the requirements of this industry, and his efforts have resulted in the construction of the machine shown in our engraving. It is made wholly of iron, the base frame being a strongly arched and ribbed casting, having broad feet, which are secured to a suitable foundation. The tempering-mill cylinder, A, is bolted to the base frame, and contains a tempering shaft, B, carrying a number of iron arms arranged spirally, and having at the lower end a sweep, shown in detail in Fig. 2. The tempering cylinder is made of large size, giving the machine perfect tempering capacity, which is very important in the manufacture of a fine quality of brick.

The upper end of the shaft, B, carries a large bevel wheel, and is journaled in a strong iron frame secured to the top of the tempering cylinder, A. This frame supports the horizontal driving shaft, also the shaft which operates the pressing mechanism, and it serves to keep all of the main driving parts accurately in line.

The press box, C, attached to the front of the tempering cylinder, contains a plunger which is driven through a forked connecting rod from the rock shaft, D, which receives its motion from a crank on the end of the shaft, E. This connecting rod straddles a standard which is secured to the packer or plunger. In the lower end of the connecting rod there is fixed a pin which passes through both branches of the fork and through a vertical slot in the standard. This pin acts against a cast iron press-pin which passes from the front across the vertical slot in the standard, thereby giving the proper downward motion to the plunger. The plunger is raised by the upward movement of the connecting rod. The press pin may be placed in different holes in the standard to vary the throw of the plunger, and when an extraordinary strain is exert ed on the cast iron pin, by the entrance of a large stone or other hard body into the presser box, the cast iron pin breaks and relieves the other parts of the machinery.

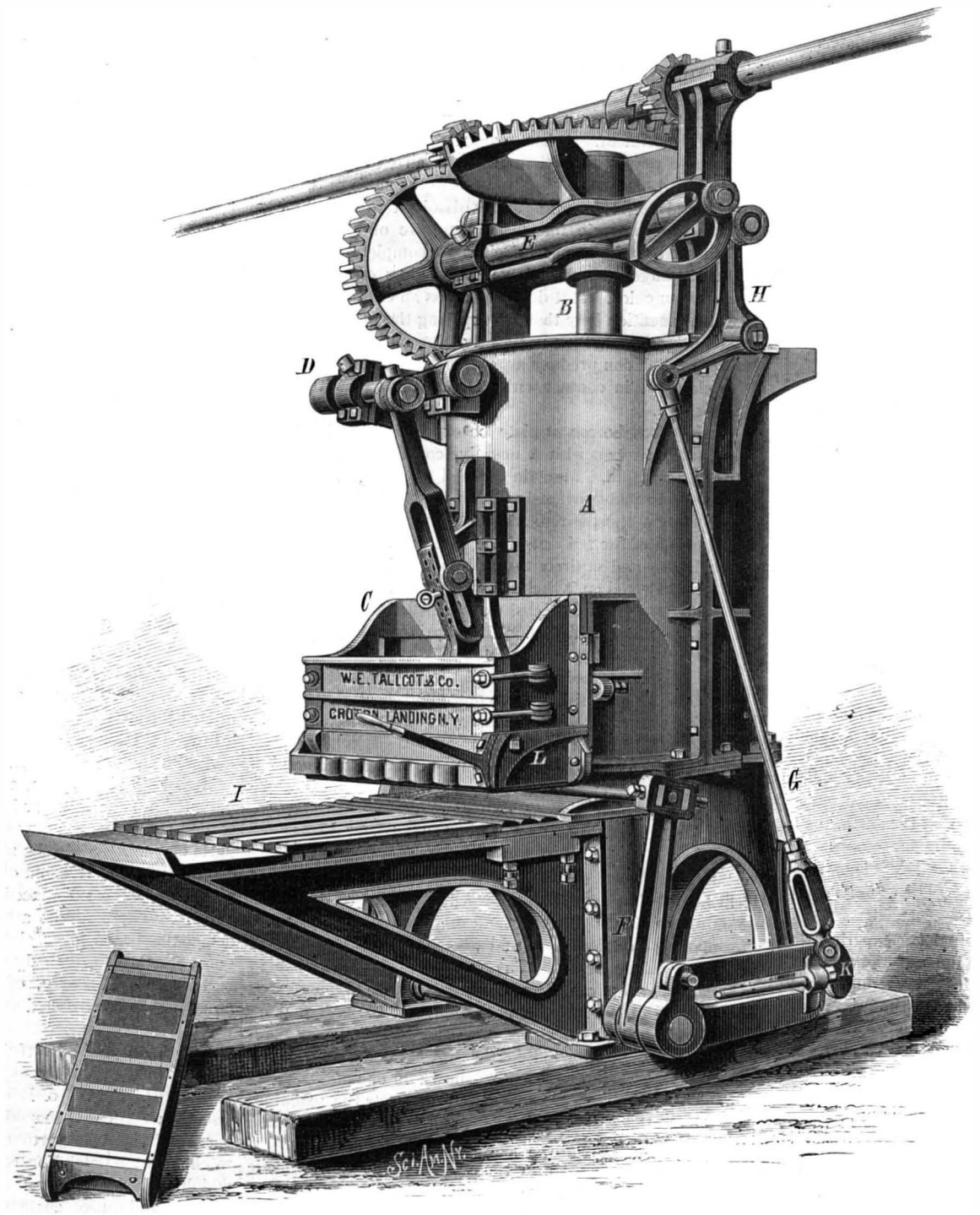
The clay which is tempered in the cylinder, A, is forced by the sweeps into the presser box, and is pressed downward by the plunger through rectangular openings in the bottom of the presser box, C, into moulds resting on the table, I, below the presser box. At proper intervals, and timing with the other parts of the machine, the levers, F, move forward, carrying a rod which pushes an empty mould forward against the filled one, forcing the latter out on the table, I, and putting the empty one in its place. The movement of the levers, F, is effected by a cam on the end of the shaft, E, through an angled lever, H, and connecting rod, G. This connecting rod is jointed at its lower end to a hooked arm, K, which engages the end of a cast iron breaking rod held by an arm on the rock shaft carrying the levers, F.

The object in using the cast iron rod is to avoid the breakage of moulds and of the mould moving mechanism should a stone or other hard body partly enter the mould during the process of pressing. An additional safety appliance is seen in the front of the presser box, the lower portion of which consists of a gate or mouth piece pivoted at each end and extending the whole length of the clod cutter. This mouth piece is held in position by a vertical spring having a hooked end, which engages in the end of the arm, L. During the movement of the mould should a stone or other obstacle come in contact with this mouth piece, the arm, L, slips by the hooked spring, allowing the mouth piece to swing on its pivots, thereby permitting the obstruction to pass out without causing damage; but should the obstacle be too large to pass through the opening in front, then the breaking rod gives way, stopping the movement of the mould, and the obstacle may be removed.



The wiper or sweep shown in Fig. 2 is attached to a hub on the shaft by means of a pin passing through it, so that it may be easily removed and replaced should occasion require. It requires eight men and a boy to run one machine having a capacity of 84 bricks per minute. The bricks are turned out square, with well defined edges, and are of fine quality.

These machines may be seen in daily use at Croton Landing. Further information may be obtained by addressing Messrs. W. E. Tallcot & Co., Croton Landing, N.Y.



TALLCOT'S BRICK MACHINE.

SNOW for PACKING FISH.—During the past winter Mr. F. P. Noble, of Carleton, New Brunswick, tried the experiment of storing snow for use in packing fish for transportation. He had three houses filled, and it is proving at once cheaper and less troublesome than ice for the purpose intended.

Experiments with Explosives.

Professor F. A. Abel, C.B., F.R.S., chemist to the British War Department, lately conducted a series of interesting and remarkable experiments on the proof grounds in the Government marshes adjoining the Royal Arsenal, Woolwich, in the presence of many spectators, including a number of officers and cadets of the Royal Navy. Professor Abel began by explaining that the violence of action of an explosive substance is regulated by the resistance opposed to the escape of the gases at the first ignition; and, furthermore, that the partial confinement of the disengaged gases by the mass of the explosive alone is sufficient to develop violent explosion. These examples he proceeded to illustrate by the first series of experiments, showing that gunpowder, and even so powerful an agent as mercurial fulminate, when ignited on the surface, produced a mild report in comparison with the result of similar charges ignited at the base of the heap. The next experiments were devoted to an exposition of the theory of detonation, the development of which, the professor said, was dependent upon the nature, quantity, and confinement of the detonator in relation to the nature and mechanical condition of the substance to be detonated. Thus twenty-five grains of mercurial fulminate exploded unconfined upon a mass of dynamite left the latter unimpaired, whereas only one grain of fulminate strongly confined produced detonation, and the dynamite was thereby exploded. Similar experiments were tried with corresponding results with gun cotton, loose and compressed, and other compounds, and then Professor Abel, having laid down the axiom that rigidity of the mass is essential to detonation, proved further that the facility and completeness with which detonation is transmitted from particle to particle of a mass of explosive material is regulated by the rigidity in the resistance to mechanical motion which the particles offer. The most perfect explosive agent known to modern science was nitro-glycerine, employed through the medium of some suitable absorbent, one of the best of which was collodion gun cotton, as used by photographers. A new compound of nitro-glycerine and an absorbent had recently been produced under the name of blasting gelatine, and this was pronounced to be the most violent explosive known to science. This gela tine, however, dispersed with little effect when fired in its ordinary state; but when solidified by freezing, which was easily accomplished, it destroyed the iron plate upon which it stood. The difference between explosion and detonation was next lucidly demonstrated. An open case containing five pounds of powder was placed upon an iron plate and exploded, but the plate was scarcely damaged; a similar quantity of gun cotton suspended four feet above the plate, however, completely crushed it, consequent upon the greater violence of the detonation and the suddenness of its development and transmission. The practical application of this rapid violence was displayed by the destruction of a bronze cannon by filling it with water and detonating therein a mere morsel of gun cotton. Various peculiar qualities of gun cotton were illustrated by successive experiments, and its power of transmitting detonation from one mass to another, as well as its rending capacity as distinguished from mere displacement, were evidenced in a startling manner by the destruction of a strongly-constructed stockade of heavy balks of timber, the tops of which were cut off level with the ground and thrown to a considerable distance. Other experiments followed, in which the efficiency and convenience of wet gun cotton were exemplified; and, in conclusion, a charge was detonated under water, throwing up a pyramid of spray to a great height.

Mr. Brown, assistant to Professor Abel, arranged the charges and fired them by electricity, and instantaneous photographs of the most remarkable displays were taken by the photographers from the Chemical Department of the Royal Arsenal.

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NEW THERMO-ELECTRIC BATTERY.

BY M. A. NIAUDET.

This battery is frequently used and is much appreciated in Austria and Germany. It is made of different forms, of which the most recent, represented by Fig. 1, appears to us to be the best, since it requires only two Bunsen burners to set in action forty thermo-electric elements. There is another model of sixty elements, with three burners, which offers the same advantages as the one represented.

Each circular group of twenty elements should be separately considered. The following is the description of such a group:

The elements are arranged in a horizontal plane, and radially; the heated junctions being towards the center of the circle, and the cooled junctions at its circumference.

The two metals are: 1st. German silver (called *maillechort* in France and *neu Silber* in Germany), and, 2dly, an alloy of antimony and zinc, which fuses at a temperature slightly higher than the melting point of antimony.

These two metals are soldered (at least at the heated junction) without the intermediary of any other metal; the ends of the German silver wires pass into a little capsule of brass, which forms the bottom of the mould in which the other metal is cast. This capsule is shown at *c*, in Fig. 2, which represents two elements of the actual dimensions; it remains attached to the element and forms part of the apparatus.

Into the same capsule penetrates a small rod, *r*, of copper, the extremity of which is also enveloped by the cast metal; and by means of this rod the heat is conducted to the heated junction. The extremities of these copper rods are arranged in a small circle, and are held between two circular plates of mica, so that they all become heated by the same flame. In the apparatus shown, a Bunsen burner is adopted; but in some simpler apparatus the flame of a spirit (wood naphtha) lamp is used. The mica plate has the effect of concentrating and directing the heat of the flame on to the copper rods.

The object of using the copper rods at the heated junction will be seen from the following: The heated junction does not obtain its heat directly from the flame, but only through the intermediary of the copper rod; it is therefore protected against any accident through overheating, that is, against the fusion of the alloy, which would cause the immediate break down of the battery.

To avoid, at least partially, the loss of heat by radiation, these copper rods are inclosed, excepting at their extremities, within a small tube, shown at *t*, in Fig. 2. The cooled junction is altogether dissimilar; the fusible metal is here soldered to a plate of copper, to which is soldered the German silver wire of the next element. The plate of copper is of large surface, forming a cylinder through which the air circulates, with the production of a cooling effect.

These batteries have been subjected to careful experimental trial by M. Waltenhofen, of Prague; he has compared them with that of Marcus, and has found them to be much superior to it.

It was found in the previous experiments of M. Stefan, of Vienna, that the thermo-electric elements of Marcus may obtain an electromotive force of one-eighteenth volt, but this maximum is obtained only at a temperature close upon the fusing point of one of the alloys of which they are formed.

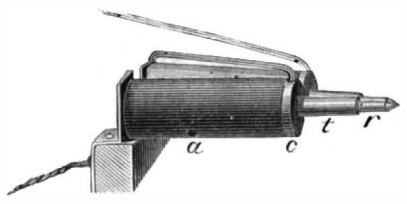
Under similar conditions, M. Waltenhofen found that the Noë elements possess an electromotive force between one ninth and one tenth volt.

In practice, these maxima, or anything near them, cannot be depended upon, and, when several elements are connected in series, they are never attained, because the elements are never equally heated. For ordinary experiments we may calculate upon one sixteenth volt per element. The resistance of each element is one fortieth Siemens' unit.

An improvement which is supplementary, but very useful in practice, consists of the addition of a regulator of the pressure of gas, by means of which any overheating, and the accidents which ensue from it, are avoided. It formerly sometimes happened that an unexpected increase in the gas pressure produced some fusion of the metal, and thus deteriorated the battery.

The safety apparatus here referred to, and which is shown in the front part of Fig. 1, consists of a glass bottle containing water, and closed by a cork. Two tubes enter this bottle through the cork; one, B B, is a branch from the gas supply, and passes to the bottom of the vessel; the other, H, does not reach the surface of the water. Its use is to lead away any gas passing into the bottle, and to conduct it to the small gas jet, I, which is kept constantly lighted. If the pressure of gas be low, the tube, B, is closed by the water; if it should become too great, the gas bubbles through the water and escapes at G, where it inflames. The apparatus thus constitutes a safety valve, preventing the pressure from rising above a certain degree, which can be regulated at will. The gas which escapes, being at once consumed, cannot give rise to accident.

FIG. 2.



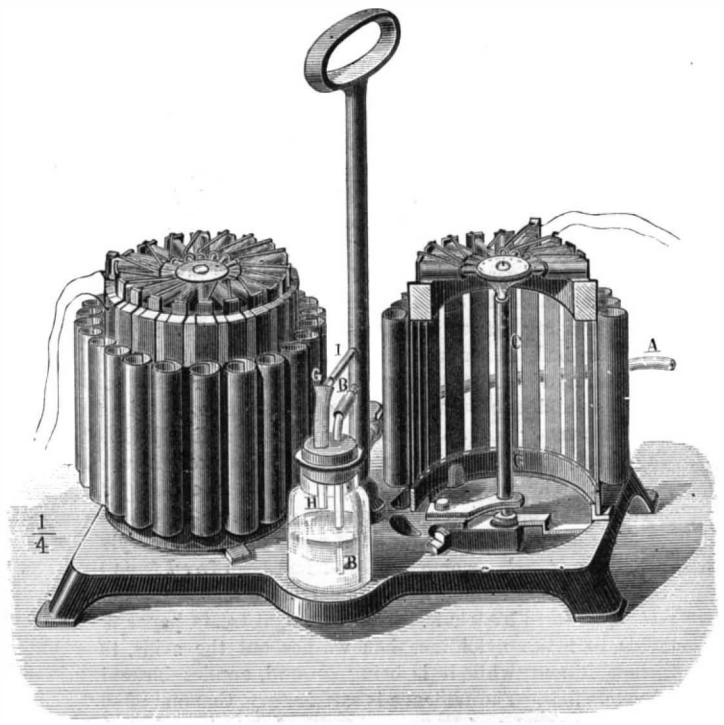


FIG. 1.—THERMO-ELECTRIC BATTERY OF M. NOE.

With a battery of twelve elements, it is possible to work an electric bell; with twenty elements, water may be decomposed in the voltameter; with forty elements, a secondary battery of Planté may be charged, or an induction coil worked. In a word, these batteries allow of most of the experiments in physics, and small industrial operations, gilding, plating, nickeling, etc., being carried into effect.

One great advantage of this kind of electro-motor is that it is set in full action in one or two minutes, and all expenditure ceases the moment the current is no longer required. Lastly, and this is the most important point, the battery undergoes no alteration by use, as in the case of those which have preceded it, and which in a short time show a considerable internal resistance, and a corresponding diminution of effect.—*La Nature.*

THE CARP AND ITS CULTURE.

In the accompanying engraving we reproduce a careful drawing of the mirror carp (*Cyprinus carpio specularis*), so called on account of the large scales which run along the sides of the body. This is one of the three races of carp recently introduced into this country, the other two being the scale carp and the leather carp, the one entirely covered with scales, the other having few or none.

Three years ago the national carp pondswere established at Washington, in the old swamp and canal near the monument, and many thousand young fish have since been distributed for stocking suitable waters in Kansas, Nebraska, Missouri, Ohio, Indiana, Illinois, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama, Louisiana, Texas, Tennessee, Kentucky, and New York. Persons desiring them for such purpose can be supplied on application to Prof. S. F. Baird, U. S. Fish Commissioner, Washington, D. C.

In a recent communication Professor Baird expresses great faith in the future of this new fish. He is quite well satisfied that within ten years it will constitute a very prominent portion of the animal food of the country. Although scarcely known in the United States, and but little more, as an article of extended application, in England and France, the carp is in Germany and Austria cultivated to the highest degree, so as to constitute a notable article of the market supply.

The fish itself is probably of Asiatic origin, and has been domesticated in China for thousands of years. It has, however, been so extensively distributed in Europe as to have become, in a measure, a native fish, occurring in public waters as well as in private enclosures. It is, Prof. Baird remarks, emphatically a farmer's fish; and may safely be claimed to be, among fishes, what chickens are among birds, and pigs and ruminants among mammals. Its special merits lie in its sluggishness and the ease with which it is kept in very limited enclosures, it being a vegetable feeder, and its general inoffensiveness. Trout and black bass require abundant water and a supply of animal food for their sustenance and growth; the carp thrive in shallow ponds, and while not disdaining flies, worms, larvæ, etc., live on the succulent roots and leaves of aquatic plants, seeds as they fall into the water, and other similar substances, and may be fed very readily upon corn, grain, bread, root crops, raw or boiled, and, indeed, any vegetable refuse.

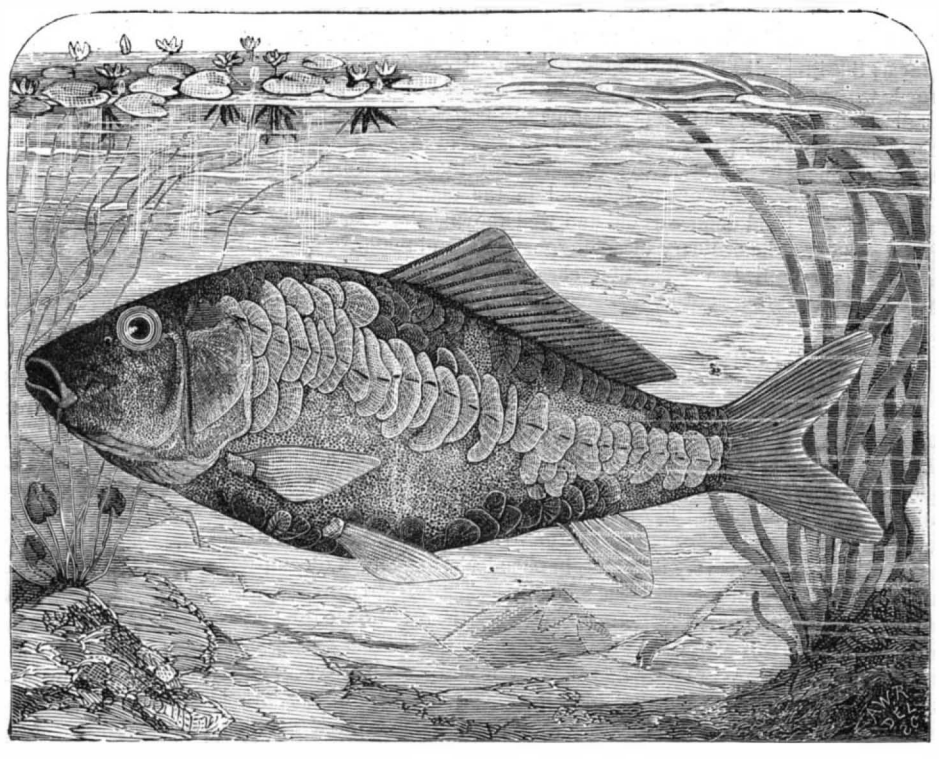
Their rate of growth, too, is something marvelous, and as observed so far in the specimens introduced into the United States, is even more remarkable here than in Europe. Among the original fish imported by the Fish Commission from Europe, and which are now only about three and a half years old, are some from twenty-five to thirty inches in length, weighing from four to eight or nine pounds.

The carp thrives best in artificial or natural ponds with muddy bottoms, and such as abound in vegetation. In large ponds it may not be necessary to furnish any special food, but in restricted enclosures, as, for instance, those of a fraction of an acre, they may be fed with the refuse of the kitchen garden, leaves of cabbage, lettuce, leeks, etc., hominy, or other substances. Grain of any kind is generally boiled before being fed to the fishes, but this is probably not absolutely necessary. The refuse of malt from breweries makes excellent food for them.

The Washington ponds are arranged so that they can be drawn off at will, leaving all the fish collected in a small basin near the outlet. This is for convenience in assorting the fish, and for selecting such as are needed for other purposes.

It is a prime necessity that there be no predaceous fish in the same pond with carp. Of course, the larger fish will be measurably secure against the attacks of carnivorous species of about the same size, but the eggs and young will become a prey to the rapacity of such associates. As a general rule the fish will thrive best when they are the sole occupants of particular waters, although the association of suckers and chubs would be less objectionable than that of sunfish, perch, or black bass.

The carp spawn in the spring, in May and June, and indeed, under some circumstances, throughout the entire summer. The Fish Commission have young fish that spawned from May to September. They are very prolific, yielding from 400,000 to 500,000 eggs, according to size. The eggs adhere tenaciously to whatever they touch, and for that reason it is very important that a new pond should be provided with floating weeds for such attachment. The eggs hatch out in a few days, and the young grow very rapidly. They feed voraciously upon the so called frog spittle, the green alga scum so common in



THE CARP AND ITS CULTURE.

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frog ponds. Consequently such waters are especially adapted to carp.

Whenever the water becomes chilled down to perhaps 40°, and especially when frozen over at the top, the fish bury themselves in the mud, aggregating in lots of from fifty to one hundred, frequently with their tails projecting, and constituting what is called in Germany, kettles or roses. It is very important that they should not be disturbed under such circumstances. Of course, while hibernating in this way they are not feeding, although they are said not to lose appreciably in weight. In the more southern regions, where the waters do not freeze, they will probably feed throughout the year, and make a more rapid growth

So far, Prof. Baird says, no waters have proved too warm for carp; indeed, they are said to thrive especially well in reservoirs receiving the condensed waters of low-pressure steam engines, in Germany, of over 100° temperature.

As regards the best plants for a carp pond, Prof. Baird mentions the ordinary pond weeds (*Pontederia* and *Sagittaria*), splatter dock, or pond lily, and, indeed, any of the kinds that grow in the water, with leaves floating upon the surface, duckweed among the number. Those which produce seed, like the wild rice, are especially desirable, as the fish feed voraciously upon them.

The great merit of the carp for cultivation, next to its excellent table quality, lies in its adaptation to shallow and warm ponds unsuited for ordinary fish. The country is full of such waters, now useless, which might be made exceedingly productive; and there are thousands of swamps in every State, which might easily be flooded and stocked at small cost in money or trouble. In Germany many villages maintain at common cost for the public benefit carp ponds of a hundred acres or more.

RECENT DECISIONS RELATING TO PATENTS.

U. S. Circuit Court—Southern District of New York.

MANUFACTURE OF CELLULOID.—DANIEL SPILL *vs.* THE CELLULOID MANUFACTURING COMPANY.

(*Decided May* 25, 1880.)

Blatchford, J.: This suit, on the proofs, involves two patents granted to the plaintiff. One is No. 97,454, granted November 30, 1869, for an "improvement in dissolving xyloidine for use in the arts." The specification states that the "invention relates to the preparation and use of certain solvents of xyloidine, and which differ from the ordinary known solvents of xyloidine, in that these menstrua which are employed are not, necessarily, in themselves, solvents of xyloidine, but become so by the addition of the bodies, compounds, or substances herein referred to." It also states that the invention consists in the employment of eight different solvents. Only the second solvent is alleged to have been used by the defendant. It is thus described in the specification: "Camphor or camphor oil, or mixture of the same, in conjunction with alcohol or spirits of wine, the same to be employed in about equal proportions." The claim is in these words:

"The preparation and use of solvents of xyloidine, such as have been before described, so as to render xyloidine more easy of conversion into compounds containing xyloidine, which are suitable for application in the arts and for industrial purposes."

The defendant has infringed this claim by using camphor in conjunction with alcohol, as a solvent of xyloidine. The defendant mixes ground and dried xyloidine with pulverized dry camphor, and then immerses the mixture in alcohol until the xyloidine is dissolved. It is dissolved by the joint action of the camphor and the alcohol. Neither alone is a solvent of xyloidine. It is immaterial, so far as the invention and the claim of the patent are concerned, whether the camphor and the alcohol are mixed so as to dissolve the camphor in the alcohol and then the xyloidine is put into the solution, or whether either the alcohol or the camphor is first mixed with the xyloidine and then the third substance is added. The bringing of the three together, causing the xyloidine to be dissolved or softened, so as to be more easy of conversion or working into compounds or articles containing xyloidine, is the invention. Making use of the solvent power of camphor and alcohol, when in the presence of each other and of the xyloidine, is the essence of the invention. The use of the camphor and the alcohol in about equal proportions is not of the essence of the invention. They are stated by the patentee to be useful in these proportions. But the evidence shows that the real invention was the discovery of the fact that camphor and alcohol, when united, would be a solvent of xyloidine.

The novelty of the invention of this solvent is attacked, but without success. The evidence is voluminous, and has been carefully considered, with the result, that the defendant has failed to show want of novelty. The prior patents adduced and examined are the English patent to Cutting, No. 1,638, of 1854; and the English patents to Parkes, No. 2,359, of 1855; No. 2,675, of 1864; No. 1,313, of 1865; No. 1,695, of 1867; and No. 1,614, of 1868. Parkes' pamphlet of 1867, and Gmelin's Handbook of Chemistry, of 1860, have also been considered, as well as the English patent to the plaintiff, No. 2,666, of 1867. No other anticipation than the above seems to be considered by the defendants' expert, and he does not allude to the pamphlet. Another defense relied on is, that one Parkes communicated to the plaintiff, in England, the knowledge that alcohol and camphor united were a solvent of xyloidine, and that the plaintiff never made the invention himself. On the whole evidence, the defendant has failed to establish this defense.

The other patent involved is No. 101,175, granted to the plaintiff March 22, 1870, for an "improvement in the manufacture of xyloidine and its compounds." There are five claims in the patent. The second alone is alleged to have been infringed. The specification says: "The second part of my invention relates to the bleaching of xyloidine, and is as follows: When it is desired to bleach or whiten the xyloidine, I bleach it directly after the removal of the acids, and before removing it from the vat. This I do by any of the well known means, preferring a solution of chlorine or a solution of chloride of lime or soda, which I add to the xyloidine, making use of alternate stirrings and rests, for a sufficient time, until the xyloidine is whitened. The solution is again drained off, and the xyloidine is repeatedly washed with water, in order to remove any excess of bleaching agents or any residue from such agents, when it will be found to be ready to be submitted to pressure in order to free the same from water, and may then be opened out, so as to prepare it for drying, dissolving, or other purposes." The second claim is in these words: "The process of bleaching xyloidine in the manner herein specified." That portion of the specification which precedes the statement of the second part of the invention relates to the treatment of vegetable fiber or lignine with acids, to convert it into xyloidine and render it soluble in suitable solvents. The fiber is intimately mixed with the acids by appropriate means, then the acids are strained and pressed from the fiber, which is now xyloidine, and it is subjected to a washing and stirring with water until it is nearly or quite free from acids, and the water is then drained off. The washing is done in a washing vat. The bleaching, as before stated, is done "directly after the removal of the acids," and before the xyloidine is removed from the vat. The evidence shows that the real invention of the plaintiff in this regard was to bleach xyloidine by ordinary bleaching agents, directly after the converting acids had been washed out of it, and before anything had been mixed with it which might interfere with the action of the bleaching agents. This is, fairly, the sense of the specification. Whether the bleaching is done in the washing vat or not, or in a solution of the ordinary bleaching agent, or by such agent not in a solution, are immaterial matters. The essential discovery was, that an ordinary and well known bleaching agent, of the character of chlorine, or chloride of lime, or chloride of soda, if applied to xyloidine, when it had become such and had been freed from the converting acids, and while it remained in that state, would act upon it to bleach it. The defendant treats paper with acids to make xyloidine, then washes out the acids, then grinds it, and, while it is being ground, applies bleaching powders to it. The evidence is satisfactory, that one of such bleaching powders is permanganate of potash, and that it was a well known and ordinary bleaching agent at the time of the plaintiff's invention. Therefore, infringement is established.

It is contended for the defendant that the claim in regard to bleaching does not claim a patentable invention, because it is merely the use, to bleach xyloidine, of what had been before used to bleach fibrous material not converted into xyloidine. The true view is well expressed by Professor Seeley, the plaintiff's expert. The defendants' expert, Mr. Edward S. Renwick, had cited four English patents, those to Martin, No. 7, of 1861; to Reeves, No. 2,797, of 1860; to Collyer, No. 550, of 1859; and to Reeves, No. 3,293, of 1866, as describing the treatment of vegetable fiber with a solution of chloride of lime or of soda, substantially as the plaintiff's patent describes xyloidine as being treated with a solution of chloride of lime or of soda. Professor Seeley says:

"The patents referred to by Mr. Renwick cover inventions relating to bleaching, by means of ordinary bleaching agencies, the ordinary fibrous substances which are used for clothing, paper stock, etc. I do not find in them anything which has more bearing upon the novelty of Spill's invention than what might be included in the matter which Spill regards and defines as old and well known. Previous to Spill's time, the ordinary bleaching materials and methods were only applied to a peculiar class of substances, namely, those substances of fibrous character which were useful only by reason of that fibrous character. Spill's invention brings the utility of bleaching upon a new kind of material, and brings it where it was very desirable, but where it was supposed to be impracticable. It is true that pyroxyline (xyloidine) has a fibrous structure, but this fibrous structure is not any essential or useful property in it. In fact, in this art, pyroxyline does not become useful until the fibrous structure is destroyed. Pyroxyline is not useful for any of the purposes to which the materials formerly bleached were applied. Pyroxyline is very different, in chemical character and composition, from the old bleachable materials. If pyroxyline had not the fibrous structure, probably the question of invention in this case would not have arisen, for then it would have appeared plainly that the case would have been very similar to that of (suppose) bleaching charcoal by ordinary bleaching agents. In the absence of experiments, the bleaching of a substance like pyroxyline would seem impracticable, almost incredible. The theory of ordinary bleaching is, that the coloring matter of goods to be bleached is of a complicated and unstable character, and is destroyed by the powerful chemical action of the bleaching agents, chlorine, oxygen, etc. Inasmuch as pyroxyline, in its manufacture, has been exposed to the action of some of the most powerful chemical agents which are known, it is unreasonable to suppose that any of the unstable coloring matter could be left in it. The bleaching of pyroxyline has often been proposed and attempted; it was especially desirable in this art; but it is my opinion that a chemist would exhaust all other theories before he would think of ordinary bleaching agents for the purpose. The subject had come up in my mind several times before Spill's invention, and I was unwilling to credit the efficacy of his plans until they were actually demonstrated to me. I know of very few inventions where so novel and useful results have been obtained by such simple and unlooked-for methods." There is no evidence to countervail this view.

The defendant has introduced evidence for the purpose of establishing that the invention claimed by the plaintiff in regard to bleaching xyloidine was previously known to Parkes, and was communicated by him to the plaintiff, and was not in fact invented by the plaintiff. The burden of showing this is on the defendant, and, on the whole evidence, it has not succeeded in doing so.

The defendant claims to have shown that other inventions claimed in the two patents were not new, so as to affect the question of costs. But the attempt cannot be held to have been successful.

There must be the usual decree for the plaintiff, for an account and an injunction, as to the claims above held to have been infringed, with costs.

Horace M. Ruggles and Edwin M. Felt for the plaintiff.

William D Shipman, Henry Baldwin, Jr., and E. Luther Hamilton, for the defendant.

The Brooklyn Bridge.

On being re-elected President of the Board of Trustees of the Brooklyn Bridge, lately, Mr. Henry C. Murphy promised that the bridge would be ready to open for use by the Fourth of July, 1881. A large body of men are at work upon the approaches to the bridge on both sides of the river. It is thought that a couple of months will suffice to complete the stone and brickwork on this side, after the purchase of certain properties has been made. The Brooklyn approach is shorter and much nearer completion.

The machinery for putting up the superstructure of the bridge is ready in the towers; but the work has been delayed owing to the necessity of constructing special machinery to cut the steel for the chords of the bridge. The largest size of steel hitherto made at the Cambria Iron Works, the most extensive in the country, measured 7 inches by 7 inches The bars for the bridge are 7 inches by 8½ inches, and to cut them enormous shears had to be made and put in position This caused a great delay in the preparation of the first 500 tons of steel. The second lot of 500 tons, it is expected, will be delivered in advance of the time specified in the contract.

New Mode for Photo-Gelatine Plates.

Prof. Geo. Herschell makes the following suggestions in a note to the *British Journal of Photography:*

I found that by adding one drachm of a dilute mineral acid (I used nitro-hydrochloric dil. B. P.) to six ounces of rectified spirit, almost any quantity of gelatine would dissolve in it on the application of a gentle heat. Plates coated with this dried in about double the time collodion takes.

Having got so far, I took some of Kennett's pellicle, and dissolved as much as I could in one ounce of spirit with ten minims of the acid. I got a nice emulsion, which flows over the plate quite as easily as collodion does. The plates are quite hard and dry in ten minutes. The emulsion must be kept warm while coating.

I hope that some of the leading gelatine workers will take these facts up and put them on a good basis, as my time for experiments is very limited. I find that ether and chloroform act as well as rectified spirit as solvents of gelatine when an acid is added. I have not had time to expose my plates yet.

The Survey of the Gulf Stream.

The sundry civil appropriation bill, just passed by the House of Representatives, provides for a survey of the Gulf Stream from its origin to its final whirl around the Sargasso Sea. The plan embraces soundings, deep sea temperatures, and current observations. The high importance of the proposed survey is clear, and when done it will add another valuable chapter to the nation's record of scientific exploration. The practical value of the proposed work, in its bearing no commerce and meteorology, is beyond estimation.

THE WONDERFUL CLOCK.—The astronomical clock invented and constructed by Felix Meier, which was illustrated and described in these columns some time ago, has been brought to this city for exhibition. In workmanship it excels the celebrated Strasburg clock, and it is a masterpiece of mechanical skill. The clock will remain on exhibition at Tammany Hall for some time, and it will repay any one interested in mechanical novelties to devote an hour in watching the movements of the figures and orbits in this wonderous clock.

Last of the Stevens Battery.

The Chancellor of New Jersey has ordered a sale of the Stevens Battery to be made by Washington R. Williams, Esq., Master, whom he directs either to make sale of the battery and its appurtenances as an entirety, or sell its materials, consisting of engines, etc., separately, whichever will yield the most money. Thus the great battery, which cost the projector so much money, and was intended to be the pride of our navy and a terror to other nations, is to be sold for old iron.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line Advertisements must be received at publication office as early as Thursday morning to appear in next issue

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The patented trademark, 'Baldwin the Clothier," is the exclusive property of O. S. Baldwin, of New York and Brooklyn, and is used only at the northeast corner of Broadway and Canal street, New York, and at the southwest corner of Smith and Fulton streets, Brooklyn. Baldwin leads the retail clothing trade of the United States.

OFFICE TROY (N. Y.) FIRE BRICK WORKS, June 1, 1880.

H. W. Johns M'f'g Co., 87 Maiden Lane, New York.

GENTLEMEN. We are in want of a quantity of roofing for some new buildings. . . . It gives us pleasure to say the Asbestos Roofing gives better results than any we have used. (Signed.) Yours truly, JAMES OSTRANDER & SON.

We keep a full assortment of Esterbrook's, Gillott's, Spencerian, Perry's, and Lamar's Pens. Send for price list to J. Leach, 86 Nassau St., New York.

For Sale.—A Baltimore City Fire Department Steam Fire Engine, in complete working order. Address P.O. Box 676, Baltimore, Md.

For Jack Chain Machines, making from 60 to 100 links per minute, direct from the coil, address Cross & Speirs, Waterbury, Conn.

Wanted—A good reliable person, who has sufficient means to apply for foreign patents for a valuable invention. Address George S. Agee, Minthill, Osage Co., Mo.

Metallic Piston Rod Packing Company, 773 Broad St., Newark, N. J. Agents wanted terms liberal.

Lubricene, Gear Grease, Cylinder and Machinery Oils. R. J. Chard, 6 Burling Slip, New York.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 49 & 50 Astor House, N.Y

Asbestos Board on Chimneys prevents their heat from affecting the temperature of rooms through which they pass. Asbestos Pat. Fiber Co., lim., 194 Broadway, N. Y.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N.Y

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Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Steel Figures, $1; Letters, $3 a set. York & S., Clev., O.

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Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Sheet Metal Presses. Ferracute Co., Bridgeton, N. J.

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Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 397.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T.Shaw, 915 Ridge Ave. Phila.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

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Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N J.

Blake "Lion and Eagle" Imp'd Crusher. See p. 365.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 366.

Peck's Patent Drop Press. See adv., page 364.

Air Compressors, Blowing Engines, Steam Pumping Machinery, Hydraulic Presses. Philadelphia Hydraulic Works, Philadelphia, Pa.

Circulars and Prices of Baling Presses Wanted. Charles Cook, 93 John St., New York

For Patent Shapers and Planers, see ills. adv. p. 380.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 316.

For Separators, Farm & Vertical Engines, see adv. p. 382.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 381.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 380

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J

Silent Injector, Blower, and Exhauster. See adv. p. 397.

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For Alcott's Improved Turbine, see adv. p. 297

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

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For Superior Steam Heat. Appar., see adv., page 397.

The "Fitchburg" Automatic Cut-off Horizontal Engines. The "Haskins" Engines and Boilers. Send for pamphlet. Fitchburg Steam Engine Co., Fitchb'g, Mass.

Millstone Dressing Machine. See adv., page 397.

Cut Gears for Models, etc. Models, working machinery, experimental work, manufacturing, etc., to order D. Gilbert & Son, 212 Chester St., Phila., Pa.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of last week.

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Inventors' Institute, Cooper Union. A permanent exhibition of inventions. Prospectus on application. 733 Broadway, N. Y.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 413.

Nellis' Cast Tool Steel, Castings from which our specialty is Plow Shares. Also all kinds agricultural steels and ornamental fencings. Nellis, Shriver & Co., Pittsburg, Pa.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

New Economizer Portable Engine. See illus. adv. p. 397.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 397. Totten & Co., Pittsburg.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 381.

NEW BOOKS AND PUBLICATIONS.

MINES AND MINING IN JAPAN. By C. Netto, M.E. Professor of Mining and Metallurgy, University of Tokio, Japan.

To Professor H. Kato, President of the Department of Law, Science, and Literature, in the University of Tokio. are we indebted for a copy of an English translation of a report on the mining industries of Japan. This Report contains a description of the modes employed in opening, ventilating, illuminating, draining, and equipping mines, and also the processes used in smelting, roasting, washing, and assaying of gold ores. It also contains the laws which govern the mining industries of Japan, and a statement of the approximate products of both the government and private mines of the country. Another interesting feature in this Report is a number of very well executed engravings representing the implements used by the miners, many of which, are not unlike those used by our own miners.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. M. M. G. writes: In your number of April 24, you ask for a mode of killing moles. Pills made of lard, flour, and a very little strychnine dropped into their holes will kill them. Corn or ground peas soaked in a strong decoction of strychnine will kill them. Perforate their holes with a small probe and drop in the poison. [Should any of our readers try the above, they should bear in mind that strychnine is one of the active poisons and should be used with great caution.]

(2) H. K. M. asks: 1. Please inform me of some good book on steam engines and the price. A. Forney's "Catechism of the Locomotive," Edwards' "Catechism of the Marine Steam Engine," Roper's "Horse Power of Land and Marine Engines." 2. Can you tell me of any preparation by which I can take grease off pigeons? They get in the garbage and get grease all over the breast, and the grease gets in the pores of the eggs, and they will not hatch. A. Try benzole 3 What is the best polish for walnut wood? A. Thin alcoholic shellac applied with a drop of oil on the polishing cushion. 4. What is the difference between a moment of force and a moment of time? A. See definition of moment in Webster.

(3) G. D. asks if there is any process by which bone can be softened so as to be cut in any size or shaped piece wanted, and afterwards the piece so cut hardened back to its original hardness. A. Bone may be softened by boiling it in muriatic acid diluted with two parts of water, hardened by digesting in lime water.

(4) S. E. asks What chemical can be put on black walnut to prevent the fire from burning it? A. Wood may be rendered to some extent non-inflammable by saturating the fibers as far as may be with a hot saturated aqueous solution of commercial tungstate of soda, and then drying slowly.

(5) W. W. asks. Can you tell me of anything that I can use in parlor match composition to prevent the crack? I have been using 4 oz. glue; 4 oz. whiting; 2 oz. crocus; 12 oz. potassum; 1 oz. phosphorus. A. Coat the heads by dipping with a common shellac varnish: shellac (common), 1 lb.; wood alcohol, 1 quart. Swift & Courtney's match is said to have the following composition

Phosphorus	30
Gum	5
Water	30
Sand	20
Binoxide of lead	20
	105

(6) R. E. A. asks how to make a mucilage in stick form (solidified), also would like to know of best plan for making a thick ink suitable for "Stoakes' Automatic Pen." A. Dissolve gum arabic in hot water to form a sirupy liquid, add a little clove oil, and thicken with powdered gum dextrine; mould and dry slowly. Concentrate a good iron gall indigo ink by evaporation over a gentle heat. Or dissolve soluble nigrosine in hot water to form an ink of the requisite consistence.

(7) R. H. S. writes: Putting common salt on a hard coal fire that is almost out seems or does revive it. Will you please give me the chemical action that takes place. A. Salt does not materially aid combustion. If the fire is hot enough the salt is volatilized; if small, the salt is more likely to extinguish it, we think.

(8) F. H. C. asks (1) how to remove rust from brass screws and trimmings, or mountings on a camera that has been exposed for a long time to dampness. A. Probably the best way to clean your brass work is to repolish with emery paper of different grades, finishing with crocus cloth. 2. How to ebonize cherry or pine wood, with details of the logwood preparation. A. For directions for ebonizing wood, see p. 91 (18), Vol. 40, SCIENTIFIC AMERICAN.

(9) W. P. asks for the most practical method, if there is any, of destroying the canker worm after it has gained a foot hold in the tree. A. Try syringing the tree with soap suds to which has been added a little hellebore

(10) R. G. asks for the best method of putting new counters in seal presses (notary, etc.) A. They are usually cast in type metal in the same way that stereotypes are cast, but an easier way is to take a piece of guttapercha, soften it in warm water, put it in the press, and bring the seal down on it. A counter of this kind does not last as long as metal, but it may be very readily renewed.

(11) E. L. K. writes 1. I am making a boiler like the one described, in SUPPLEMENT 182. The tubes are three inches in diameter and 18 inches long. Will it do to make the casing, which is 16 inches in diameter, of cast iron? A. If you refer to the boiler on page 2891, you can make the casing of cast iron, but it should be lined with fire brick or some other non-conductor. 2. How large an engine will the boiler run? 2. It will depend upon the speed of the engine and the pressure you wish to carry. 3. How much pressure will it safely stand? A. If the tubes are properly proportioned and sound, 120 to 140 lb.

(12) H. writes: I desire to make a small ice box, one in which I can preserve for twenty-four hours a few pounds of ice. What is the best material to pack such a box with, and how thick should the packing be? A. A box with a 2½ inch air space between the walls all around answers very well, providing the air space be perfectly tight. Saw dust, when dry, makes a good filling. Powdered charcoal is frequently used.

(13) J. T. H. asks: Has any one ever used a line of shafting laid at an incline in place of horizontal? Will such a shaft inclined, say one foot in ten, 2¼ diameter, 100 feet long, work? A. A shaft inclined one foot in ten will work, but all connections with it must be made to conform to the angle.

(14) W. H. P asks for a rule for calculatting the pressure of steam on a cylinder boiler at any given number pounds of steam. A. Multiply the diameter in inches by the length in inches and by the pressure per square inch; the result is the total pressure tending to rupture the boiler

(15) R. F. R. writes I made a copying pad after the receipt given in the SCIENTIFIC AMERICAN, but I notice the copies have a faint color; I think they should be darker. Can you tell me what to put in with the ink to produce a clear impression? A. In preparing the ink use pure methylaniline violet (3 B shade) or blue, and see that the solution is complete before attempting to use it. If the directions are properly carried out there will no difficulty. If the ink does not flow readily add a little more alcohol.

(16) G. W. R. asks: 1. How can I find the pressure of wind per square foot at different velocities? A. Use a wind pressure gauge or anemometer. 2. Why is the common galvanometer not used in receiving dispatches on the Atlantic cable instead of the looking glass attachment which requires a darkened room? A. Because the pencil of light from the reflector forms a very long index having no weight. 3. What would be the cost of one of Edison's lamps and generators ready for motive power? A. We believe they are not in the market yet. 4. How high will a pressure of fifty pounds per square inch raise water? A. 112 feet. 5. How much is air compressed at a pressure of fifty pounds per square inch? A. 4·38 times or volumes. 6. Is a rotary bellows the best machine for compressing air to the above pressure? A. No. 7. Is a rotary engine best for applying its power to machinery? A. No. 8. Is compressed air the best agent for keeping a power which is supplied (irregularly) for future use (once in 24 hours)? A. You may use compressed air, but a column or head of water is to be preferred.

(17) F. W. & Co. ask: What can be used to remove the gloss on tin cake cans so as to make the labels stick well which are put on with flour paste? A. Try strong hot solution of caustic potash or soda.

(18) J. T. asks what to put into glue to make it perfectly insoluble. A. Glue is rendered insoluble by tannic acid (tannin). The tannin may be dissolved in a small quantity of soft water.

(19) A. P. G. asks: What will remove soil spots, such as grease and dirt, from parchment paper, such as diplomas are written upon? A. To remove the grease spots cover with hot pipe clay and place under pressure for a few hours. Dirt stains must be removed by mechanical means.

(20) W. H. asks: Is there a single engine made to reverse with one eccentric, without changing the position of the eccentric on the shaft? A. Yes, by making the valve without lap or lead.

(21) J. J. W. asks how Leghorn hats are whitened (otherwise than with the fumes of sulphur), or can you give a receipt to whiten with a varnish? A. Immerse in a strong aqueous solution of sulphite of soda or bleaching powder (chloride of lime), and then in dilute sulphuric acid (acid 1, water 5). The bleaching powder treatment requires much subsequent washing, or the use of an antichlore dip, hyposulphite of soda dissolved in 20 parts of water.

(22) A. B. H. asks for some simple test for water to see whether it is safe to use or not. I took some tannic acid and put it in well water. No. 1 turned greenish blue; No. 2 acquired a reddish tinge; No. 3 bluish green with quite a deposit on the bottom of the tumbler and quite a bit of substance floating around in it. The surface of all these waters had a glassy look. The water was hard. No. 4 was water taken out of a cistern; the acid did not change this water. Please tell me what the above tests—if they can be called tests—indicate? A. Pure tannic acid (tannin) causes a bluish or greenish blue discoloration or precipitate in water containing salts of iron—with which it forms ink. When the water contains any considerable quantity of gelatine or albuminous matters, tannin occasions the formation of a finely divided precipitate, at once or after standing for a time. When the quantity is small this gives the water an opalescent appearance, and sometimes a slightly pinkish tint when viewed by transmitted light. After remaining in a warm, quiet place for some hours, the precipitate separates as a curdy or semi-gelatinous mass. Such water may be considered unfit to drink. Before using the tannin solution should be allowed to stand for some hours and should then be filtered

(23) R. F. asks how to clean rubber stamps. A. Try a little strong hydrochloric acid.

(24) S. L. writes: I propose building a double boat, 50 feet long, ⅛ inch iron, air tight; each boat 30 inches in diameter, joined by staunchions making an outside beam of 12 feet. 1. What would be the carrying capacity? A. We cannot give the carrrying capacity without knowing the form of your cylinders. 2. Would it carry engine power sufficient to propel at rate of seventeen miles per hour, and the power required? A. No, not with paddle wheels. 3. What diameter of side wheels, with feathering floats, would be required, and the number of buckets to each wheel? A. You cannot put in wheels of any size that will give the speed. 4. What would be the best coating inside and out to keep the iron from rusting on a fresh water lake? A. Brown oxide paint ground in pure linseed oil. There is a catamaran steamboat building here, which will be completed within the next sixty days. We advise you to wait the result, before investing your money in a similar project, if speed is your object.

(25) O. & D. write: Owing to the mildness of last winter the ice crop was scarce and the price is high. Is there not some simple way by which one can at little expense reduce the temperature of our city water, so as to render it a little more drinkable? I thought of using a jar and covering it with a layer or two of some coarse cloth, and keeping a small stream of water running on it, just enough to keep it wet. Would the evaporation reduce the temperature materially, and what part of the house would it be best to keep it? Perhaps there is some better method, if so, I am sure you would confer a great favor on many who cannot afford to take ice this summer. A. The simplest form of water cooler is perhaps the porous (unglazed) earthen jar. When filled with water the latter oozes slowly through the porous material, evaporates, and keeps the jar cool. The jar must, however, be kept away from heat radiating surfaces. The plan you suggest is also a good one; the cloth should not be too thick, and the jar should be as tall and narrow as convenient so as to expose as large an evaporating surface as possible.

(26) A. B. asks for a receipt to make ice cream. A. The following gives excellent results: Scald a gallon of good sweet milk, and add to it with constant stirring eight eggs well beaten with one pound white sugar, and four spoonfuls of cornstarch, first mixed into a thick cream with cold milk. Cool, flavor to suit and freeze.

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(27) F. P. N. asks: Is there any sympathetic ink, or any preparation that may be used for writing, which will fade out completely within ten hours, or can the paper be so prepared as to cause the ink to fade out? A. An aqueous solution of chloride of cobalt forms an ink, writings made with which become practically invisible on ordinary paper at ordinary temperatures, and may be developed to a dark blue by gently warming. The addition of a small quantity of chloride of calcium or glycerine materially affects the rapidity of this change.

(28) G. S. H. asks: Can you inform me what will remove fungi from glass, which you described in the SCIENTIFIC AMERICAN dated May? We have a large glass, which has for some time been accumulating this fungi and which is continually spreading. A. Try fine rouge moistened with caustic soda solution in water.

(29) E. M. L. writes: 1. I am using ten feet of rubber hose to convey common illuminating gas from a chandelier to a small furnace for heating glue. It appears that the gas permeates through the tubing. Does gas permeate through rubber? If so, how can it be remedied? A. Diffusion takes place through such tubes, but the quantity escaping in an hour is very small and would escape detection by ordinary means. See that there is no leak in the tube or its connections. It would be difficult to obviate the diffusion. 2. I have a set of brass chessmen—how can I give them a black color? A. Dip bright in nitric acid, rinse quickly in running water, blacken by immersion in muriatic acid 12 parts; copperas, 1 part; white arsenic, 1 part; rinse, polish with sawdust or black lead, and lacquer well; or coat them with thin black japan, and harden the coat by heating in an oven.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

C. F. B.—No. 1. Syenite, sometimes metalliferous. No. 2. Chiefly copper sulphuret, probably carrying silver. Some of this may be quite rich in the latter metal—worth assaying. No. 3. Chalcedony—a variety of quartz of little value unless found in abundance and in large pieces.—D. N. P.—Ferruginous clay containing much carbonaceous matter. 2. Carbonate of lime and iron oxide. 3. Argillite. 4. Quartz. None of these is valuable.—B. T. W.—It is sulphate of lime gypsum.—A. M. R.—It is clay slate—of little value.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

May 25, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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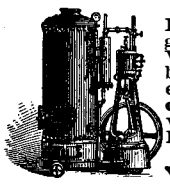

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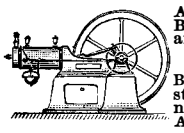

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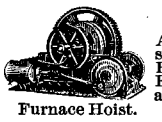

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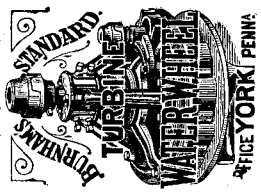

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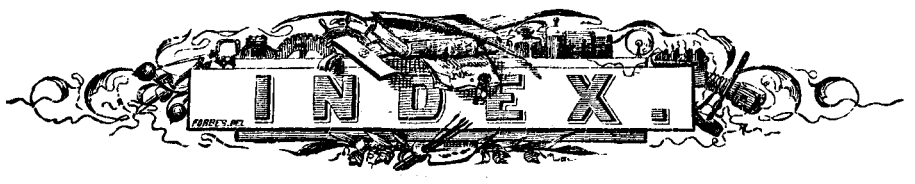

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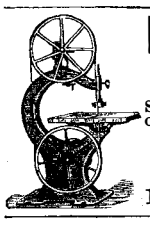

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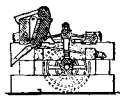

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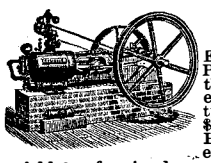

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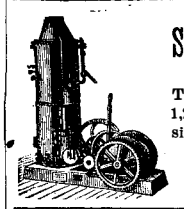

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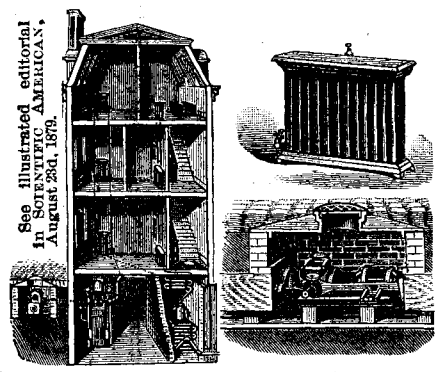

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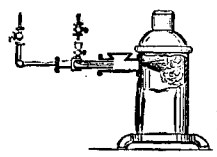

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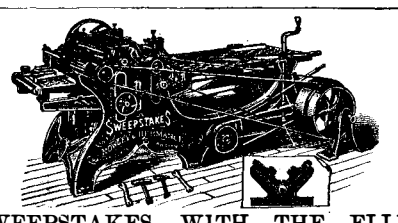

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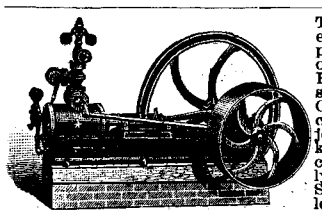

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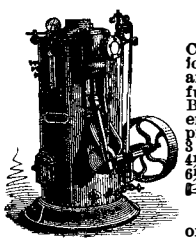

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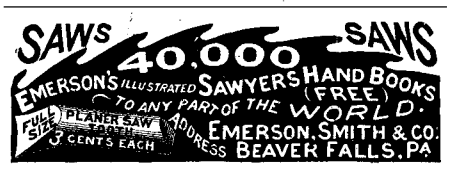
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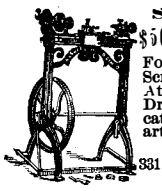

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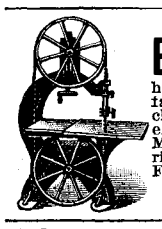

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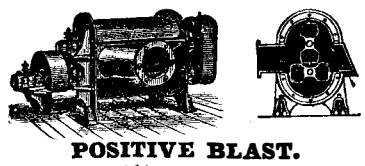

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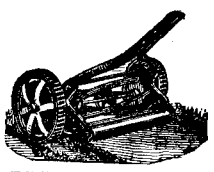

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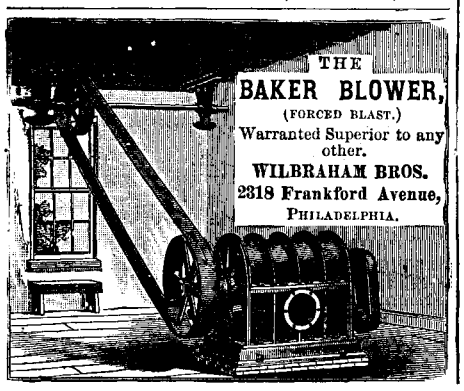

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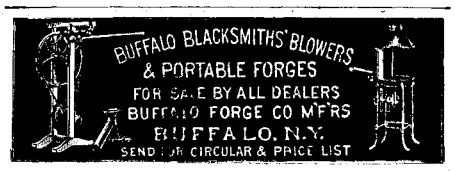

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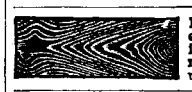

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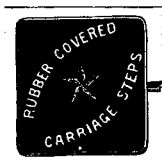

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